SCIENCE

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THE INHERITANCE OF ACQUIRED CHARACTERISTICS.*

PROFESSOR COPE'S defense of the doctrine of the inheritance of acquired characters was selected from the evidence contained in his book, 'The Primary Factors of Organic Evolution.' He referred especially to the history of the moulding of the articulations of the vertebrate, and especially of the mammalian skeleton, of which such complete series has been furnished by paleontology. The forms of the articulations he believed to be the result of their movements, for the reason that they could be formed artificially, as the result of experiment, or in consequence of luxations. He believed that the resulting forms have been inherited, because they are found in the embryo before the animal has had an opportunity of developing the structure for himself by interaction with the environment.

He admitted the justice of Dr. Minot's demand for an explanation of this phenomenon. He stated that the preformationists offered no explanation, and, indeed so far as he could see, none was possible from their point of view. The epigenesisists could, on the contrary, appeal to the

* Abstract of Professor Cope's part in the discussion by Professors Minot, Macfarlane, Cope and James before the Boston meeting of the American Society of Naturalists, prepared at the request of the editor by the late Professor Cope.

phenomena of memory as a plausible explanation. Stimuli from without and from within the organism leave a record on the brain-cells which give the form to consciousness, when the latter invades them, along the guiding lines of associations. Why should not the germ-plasma be capable of a similar record of stimuli which is expressed in the recapitulatory growth of the embryo? He thought that the evidence pointed to such a process. These stimuli affected the soma and the germ-plasma simultaneously in accordance with the doctrine of Diplogenesis, but that the soma only records results in each tissue which are appropriate to the functions of the same, while the germ-plasma and brain-cells may record them all. The certainty of record in both cases he supposed to depend on the frequency and strength of the impression, as is known to be the case with the memory of the mental organism. Hence mutilations or single impressions are rarely recorded, while those due to the constant and habitual movements are recorded, and form the physical basis of growth and of evloution of type.

He further remarked that the belief that natural selection originates structure cannot be entertained, as paleontological evidence shows that evolution has proceeded by very gradual additions and subtractions of character, which required long periods to become of any value in the struggle for existence, sometimes an entire geological period being occupied in the elaboration of a character to structural usefulness.

Finally he referred to the physical mechanism of mental phenomena, and stated that some physiologists require a completed machine for the performance of special mental functions. The speaker called attention to the fact that the fundamental sensations do not even require a nervous system for their expression. Thus Protozoa appear to experience the sensations of hunger, temperature and the muscular sense of resistance. Hence it is as true of the physical basis of mental as of other functions that the function produces the structure, while structure merely specializes or perfects function.

ORGANIC SELECTION.

In certain recent publications* an hypothesis has been presented which seems in some degree to mediate between the two rival theories of heredity. The point of view taken in these publications is briefly this: Assuming the operation of natural selection as currently held, and assuming also that individual organisms through adaptation acquire modifications or new characters, then the latter will exercise a directive influence on the former quite independently of any direct inheritance of acquired characters. For organisms which survive through adaptive modification will hand on to the next generation any 'coincident variations' (*i. e.*, congenital variations in the same direction as adaptive modifications) which they may chance to have, and also allow farther variations in the same direction. In any given series of generations, the individuals of which survive through their susceptibility to modifi-

*H. F. Osborn, Proc. N. Y. Acad. of Sci., meeting of March 9 and April 13, 1896, reported in SCIENCE, April 3 and November 27, 1896. C. Lloyd Morgan, 'Habit and Instinct,' October, 1896, pp. 307 *ff.*, also printed earlier in SCIENCE, November 20, 1896. J. Mark Baldwin, discussion before N. Y. Acad. of Sci., meeting of January 31, reported in full in SCIENCE, March 20, 1896, also *Amer. Naturalist*, June and July, 1896. The following brief statement has been prepared in consultation with Principal Morgan and Professor Osborn. I may express indebtedness to both of them for certain suggestions which they allow me to use and which I incorporate verbally in the text. Among them is the suggestion that 'Organic Selection' should be the title of this paper. While feeling that this cooperation gives greater weight to the communication, at the same time I am alone responsible for the publication of it.

cation, there will be a gradual and cumulative development of coincident variations under the action of natural selection. The adaptive modification acts, in short, as a screen to perpetuate and develop congenital variations and correlated groups of these. Time is thus given to the species to develop by coincident variation characters indistinguishable from those which were due to acquired modification, and the evolution of the race will proceed in the lines marked out by private and individual adaptations. It will appear as if the modifications were directly inherited, whereas in reality they have acted as the fostering nurses of congenital variations.

It follows also that the likelihood of the occurrence of coincident variations will be greatly increased with each generation, under this 'screening' influence of modification; for the mean of the congenital variations will be shifted in the direction of the adaptive modification, seeing that under the operation of natural selection upon each preceding generation variations which are not coincident tend to be eliminated.*

Furthermore, it has recently been shown that, independently of physical heredity, there is among the animals a process by which there is secured a continuity of social environment, so that those organisms which are born into a social community, such as the animal family, accommodate themselves to the ways and habits of that community. Professor Lloyd Morgan,† following Weismann and Hudson, has employed the term 'tradition' for the handing on of that which has been acquired by preceding generations; and I have used the phrase 'social heredity' for the accommodation of the individuals of each generation to the social environment, whereby the continuity of tradition is secured.*

It appears desirable that some definite scheme of terminology should be suggested to facilitate the discussion of these problems of organic and mental evolution; and I therefore venture to submit the following:

1. *Variation:* to be restricted to 'blastogenic' or congenital variation.

2. *Accommodation:* functional adaptation of the individual organism to its environment. This term is widely used in this sense by psychologists, and in an analogous sense by physiologists.†

3. *Modification* (Lloyd Morgan): change of structure or function due to accommodation. To embrace 'ontogenic variations' (Osborn), *i. e.*, changes arising from all causes during ontogeny.

4. *Coincident Variations* (Lloyd Morgan): variations which coincide with or are similar in direction to modifications.

5. *Organic Selection* (Baldwin): the perpetuation and development of (congenital) coincident variations in consequence of accommodation.

6. *Orthoplasy* (Baldwin): the directive or determining influence of organic selection in evolution.‡

7. *Orthoplastic Influences* (Baldwin): all agencies of accommodation (*e. g.*, organic plasticity, imitation, intelligence, etc.), con-

* This aspect of the subject has been especially emphasized in my own exposition, *American Naturalist*, June, 1896, pp. 147 *ff.*

† Introduction to Comp. Psych., pp. 170, 210, 'Habit and Instinct,' pp. 183, 342.

* 'Mental Development in the Child and the Race,' 1st ed., January, 1895, p. 364, SCIENCE, August 23, 1895.

† Professor Osborn suggests that 'individual adaptation' suffices for this; but that phrase does not mark well the distinction between 'accommodation' and 'modification.' Adaptation is used currently in a loose general sense.

‡ Eimer's 'orthogenesis' might be adopted were it possible to free it from association with his hypotheses of 'orthogenic' or 'determinate' variation and use-inheritance. The view which I wish to characterize is in some degree a substitute for these hypotheses.

sidered as directing the course of evolution through organic selection.

8. *Tradition* (Lloyd Morgan): the handing on from generation to generation (independently of physical heredity) of acquired habits.

9. *Social Heredity* (Baldwin): the process by which the individuals of each generation acquire the matter of tradition and grow into the habits and usages of their kind.*

J. Mark Baldwin.

Princeton University,
March 13, 1897.

WHAT IS A TYPE IN NATURAL HISTORY?

All naturalists concede that type specimens constitute the most important material in a museum of natural history. The true appreciation of this fact, however, is of recent date, and is shown in the numerous lately published catalogues of types possessed by different museums. The greater number of these publications have appeared in England and America. This just valuation of type material in recent years has come about through the work of specialists in their efforts to monograph groups of organisms. In those branches of natural history where original descriptions are usually accompanied by figures, the value of type material is not so apparent as where no figures are given, but in all branches of this science except bacteriology, it is upon the type material that the entities of natural history and its taxonomy rest. It is therefore of the greatest importance to learn the whereabouts of types. The object of this article, however, is not to point out the great scientific value of type specimens, but to determine what constitutes a type and what kinds of types exist.

There is considerable diversity of opinion as to what is meant by a type. One writer states that "By a type is meant the original specimen to which any generic or specific name was first assigned."*

The late Dr. G. Brown Goode writes that

> By a type is meant a specimen which has been used by the author of a systematic paper as the basis of detailed study, and as the foundation of a specific name. In cases where a considerable number of specimens has been used, it is desirable to separate one or more as being the *primary types*, while the other specimens, which may have been used in the same study for the purpose of comparison, may be regarded as *collateral types*.†

A mammalogist further states that "The word 'type' itself, when first introduced, was meant to refer to the particular specimen (in the singular) originally described, but it was soon naturally applied to any individual of the original series, if more than one specimen was examined by the describer."‡

These citations clearly show that a type is not always restricted to a single specimen selected by an author, but also applies to several, or even to all the specimens contained in the original lot. Moreover, the word type has been applied to specimens sent out by the author of a species, but not

* Professor Lloyd Morgan thinks this term unnecessary. It has the advantage, however, of falling in with the popular use of the phrases 'social heritage' and 'social inheritance.' On the other hand, 'tradition' seems quite inadequate; as generally used it signifies that which is handed on, the material; while in the case of animals we have to deal mainly with the process of acquisition. 'Social heredity' also calls attention to the linking of one generation to another. However, I think there is room for both terms. For further justification of the terms 'Social Heredity' and 'Organic Selection,' I may refer to the *American Naturalist*, July, 1896, pp. 552 ff.

*T. McKenny Hughes, Catalogue of the Type Fossils in the Woodwardian Museum, Cambridge, 1891; prepared by Henry Woods.

†Circular letter of July 1st, 1893, to Curators in the U. S. National Museum.

‡Suggestions for the more definite use of the word 'type' and its compounds, as denoting specimens of a greater or less degree of authenticity, by Oldfield Thomas. Proc. Zool. Soc. London, 1893, pp. 241–2.

described in the original paper. Students of parasitic insects often rear numerous individuals from a single mother of a new species, any one of which is naturally as much like the type as those selected by the author. Some of the individuals of such broods are distributed to other workers and museums as types. For a clear description of a new species a paleobotanist may require as many individuals as there are specimens selected for study, all of which are regarded as types. Because of the general imperfection of fossils, much of the original material is usually accepted by paleontologists as types, but when specimens are figured, as is the general custom, it is good practice to regard these alone as types. The writer is not aware that any invertebrate paleontologist in America ever considers a species to be based upon a single specimen, if others are present at the time of original publication. It is doubtful if many species, living or extinct, can be defined from a single individual; hence the multiplicity of types is generally a necessity. In birds and mammals, where the sexes usually exhibit marked differences, there are seasonal modifications, a bony skeleton, geographical and individual variation, and stages of growth, and all these parts and variations require material for the proper and final interpretation of species. The practice of selecting a single example as the type, however, has its advantages, since all doubt is thus removed when a new species is later found to contain diverse elements.

The writer believes that it is possible to harmonize all these different conceptions as to what constitutes a type. The following is, therefore, offered as an expression of individual opinion, in the hope that biologists will, when necessary, emend the different definitions here given or offer new ones, so that a proper terminology in regard to types may come into general use.

KINDS OF TYPES.

Type Material.—This includes all specimens which have served as the basis for published primary and supplementary descriptions and figures. Mere lists of names should not be regarded as based upon 'type material;' neither should typical undescribed specimens of the original series identified by the author of a new species, nor the reared original duplicates of a series out of which the type material was selected, be sent out to collectors and museums as types. There are, therefore, two great groups of type material: primary and supplementary types. These may be defined as follows:

Primary Types.—These are the described or figured specimens of any new species. There are three kinds of primary types: holotype, cotype and paratype. To these may be added a fourth, plastotype, including all artificial reproductions moulded directly from some primary type.

Supplementary Types.—These consist of the described or figured specimens used in publication in extending or correcting knowledge of a previously defined species. For such type material the term hypotype (*hypo*=under or sub, and *typos*=type) may be used. For artificial reproductions moulded directly from a supplementary type, *hypoplastotype* may be useful.

The collective term, 'type material,' therefore includes all specimens used in publications and upon which the entities of natural science are founded. 'Primary types' include only the material of a new species, while 'supplementary' or 'hypotypes' are those specimens supplementing knowledge of a previously defined species. The various kinds of primary types may be defined as follows:

Holotype (*holos*=whole or entire, and *typos*=type).—A holotype in natural history is a particular individual deliberately selected by the author of a species, or it

may be the only example of a species known at the time of original publication. A holotype, therefore, is always a single individual, but may embrace one or more parts, as the skin, skeleton or other portions. When a holotype is selected, but other specimens are also described, the latter must be known as paratypes. When no holotype is selected, and more than one specimen is described, all become cotypes. Therefore, the original material of any species cannot include a holotype and cotypes, but may include a holotype and paratypes, or all may be cotypes.

In cases where a holotype is selected, but no description or designation is given to distinguish it from the associated material, the holotype practically does not exist.

In cases where a holotype has been selected, but the diagnosis is found to contain more than one species, the remaining material will always constitute the paratypes. These will not necessarily remain as such under another name, but will always be the paratypes of the new species as interpreted by its author.

The author of a new species having failed to select a holotype, no subsequent author can do this for him. No just law is retroactive. However, there are two exceptions which appear not to violate this law: first, when the original definition includes two or more species; and second, when no holotype is selected and but a single example is figured. Further remarks on these exceptions follow:

In cases where a single individual is originally figured, no holotype being selected, and the original diagnosis is known to be based upon several examples, it is recommended that the figured one be regarded as the holotype by subsequent authors. The remaining material described will, therefore, be changed from cotypes to paratypes, since out of the original series the holotype has been selected. (See definition of cotype.)

Where the original diagnosis is without illustrations and contains more than one species based upon cotypes the first subsequent author is at liberty to select from these a holotype for the old species, adhering as far as can be ascertained to the intention of the original author. For the other new species, if any, he may select from the remaining cotypes, or from other material in his possession, the holotypes or cotypes of his new species.

In cases where a new species is not directly based upon material, but upon the published description of an earlier author, the specimens of the latter become the type material of the new species. The kind of type then present will depend on whether in the original description a holotype had been selected.

A species described or new and proving to be a synonym does not affect the type material of the species with which it is synonymous. All such synonymous material, however, should be carefully preserved and marked as holotype or cotype under the original name as well as under the one of which it is known to be a synonym.

Cotype (or associate type).—Cotype was introduced by Waterhouse, and is defined by Oldfield Thomas as follows: "A cotype is one of two or more specimens together forming the basis of a species, no type [holotype] having been selected. No species would have both [holotype] and cotype, but either the former [or holotype and paratype], or two or more of the latter." In cases where the cotypes are unmarked and cannot be distinguished from the balance of the original series the only safe plan to follow will be to regard all the original material of a new species as cotypes. If such specimens are sent out to collectors and museums they should be marked as cotypes.

Paratype (*para*=beside, and *typos*=type).—"A paratype is a specimen belonging to the original series, but not the type [holotype], in cases where the author has himself selected a [holotype]. It should, however, be one of the specimens * * * [described] in the original description." The present writer has removed from this definition of Thomas, the words 'mentioned or enumerated' and substituted 'described.' Specimens merely mentioned or enumerated add no characters to the description of a species. Lists of specimens giving measurements, however, do add to the knowledge of a species, and are to be regarded as type material, either as paratype, cotype or hypotype, as the case may be.

A paratype may be subsequently selected as a holotype when it proves to be a new species and is not the species to which it was originally referred.

Plastotype (*plastos* = formed or moulded, and *typos* = type).—Any artificial specimen moulded directly from a primary type. There are many specimens of this kind in existence, cast directly from fossils, and these are often quite as good as the originals. No models, however, can be included, since they are not cast from type material. Artificial casts made from supplementary material will become plastotypes if a specimen from which the reproduction was made is subsequently used for the founding of a new species.

In this connection it may be well to give a name to artificial casts made from supplementary types, since some have a very decided value. For instance, many artificial casts are in museums of one of the supplementary types of the trilobite Isotelus gigas, the only one preserving the ventral limbs. For such the term *hypoplastotype* may be useful.

In paleontology fossils are sometimes described and illustrated from artificial casts or squeezes made from natural rock cavities from which the fossils have been leached. Such plastotypes are not to be regarded as type material. The natural moulds from which they are made, however, should always be so considered.

TYPICAL MATERIAL.

Mr. Thomas has also proposed the terms 'topotype' and 'metatype.' The material to which these terms are applied has not served in publication, but simply refers to typical material, either derived from the type locality (topotype) or derived from the type locality and identified by the author of a new species (metatype).

These were defined as follows: *Topotype.*—'A specimen simply collected at the exact locality where the original type was obtained.' *Metatype.*—'A specimen received from the original locality after the description has been published, but determined as belonging to his own species by the original describer himself.'

Genotype (*genos* = race, and *typos* = type).—Genotype applies to any typical material of the type species of a genus. The material, however, should be, if possible, from the original locality of the species, or a genotype should also be a topotype or metatype. Therefore there may be as many genotypes of Lingula as there are museums having characteristic specimens of Lingula anatina.

MARKING OF TYPE MATERIAL.

All type material should be plainly and permanently marked to distinguish it from other specimens. If this is carefully done, much doubt will be removed for subsequent students. When such material is large, as birds and mammals, a small highly colored card or a piece of plain zinc may be attached, upon which should be printed or stamped the proper term indicating the kind of type and the museum catalogue number. In paleontology it is the custom to glue small colored tickets upon the type

material in addition to the catalogue number, when sufficiently large to permit of this without covering too much of the specimen. The small specimens are placed in numbered vials or boxes. In the Woodwardian Museum (Cambridge) type fossils are mounted on blue tablets. This arrangement, however, has the disadvantage of giving the exhibition series a checkered appearance, and should the specimens become loosened and displaced there is danger of the types being overlooked.

CHARLES SCHUCHERT.

THE FAUNA OF CENTRAL BORNEO.

IN 1893 the Netherlands Commission, established for the purpose of promoting research into the natural resources of the Dutch colonies, united with a similar society formed in Batavia composed of merchants, financiers and government officers in organizing an expedition of scientists to central Borneo, a hitherto scientifically unexplored region.

Herr Büttikofer was the zoologist of the expedition and presented an account of its results to the third International Zoological Congress, held last year at Leyden, and his report has since been printed in the *Compte-rendu* of the Congress.

To zoologists it is hardly necessary to say that Herr Büttikofer is the distinguished curator of the Zoologischen Reichs Museum in Leyden, and the author of 'Reisebilder aus Liberia' (Leyden, E. T. Brill, 1890), the best zoological and sociological study of that country which has been made, and which in its minute descriptions of animal life is superior to any work upon any part of the African continent with which we are acquainted.

The work of the expedition was divided into six departments: Geology, Mineralogy, Botany, Zoology, Anthropology and Ethnography. Of these geology and mineralogy were assigned to Professor Molengraaff, of Amsterdam; Botany, to Dr. Hallier, of Buitenzorg (Java); anthropology and ethnography to Dr. Nieuwenhuis, who was also medical officer; and zoology to Dr. Büttikofer, as before stated. Each had perfect control of his own department as to the field of research and the time to be spent. In anthropology and ethnography not much could be expected, as they require a much longer residence and acquaintance with the native populations than such expeditions usually afford.

"In my own department," says Herr Büttikofer, "I had the valuable assistance of a black man, Max Moret, a soldier in the Dutch army who had before accompanied Professor Selenka in his Borneo journey." "The natives became interested in my department and willingly lent me a helping hand."

Herr Büttikofer reached Batavia, November 1, 1893, and during his three weeks' stay in Java made an excursion to the Preanger regencies, and to the lofty mountains Gedeh and Pangerango, where he obtained among other specimens the very rare *Merula javanica*. Leaving Java on November 17th, he landed at Pontianak, on the west coast of Borneo, and ascending the mighty river, Kapuas, established a central station at Smitau. The river being in flood, the hunting was confined to birds and other tree-living animals, and many new specimens were obtained.

In December they moved on to Mt. Kenepai (1200 metres), near the borders of Sarawak, where on higher ground a better field was found. Ascending the mountains, they pitched their tents half way to the summit and found the life most romantic. "In the early dawn we were awakened by the loud jodelling of gibbons and the ear-splitting shriek of the Rhinoceros birds, after which, as the morning advanced, the other members of the winged orchestra joined in the chorus."

The rain and fog and the resulting humidity were very annoying, as the specimens dried at the fire when taken away, immediately became wet again. "The orangutans amused themselves by swinging in the tree tops over our heads." From the isolated peak of Kenepai the view was beautiful and disclosed here and there in the forest-covered plain the waters of the Kapuas and Kenepai stretching out into a chain of lakes; on the north Mt. Tutup reared its head, its foot hills forming the southern boundary of Sarawak.

Returning to Smitau in February, 1894, the specimens were prepared for shipment, and at the end of the month a new start was made for the Mandai river, one of the principal tributaries of the upper Kapuas, and having its source in a great group of mountains, which sends out the Mandai and the Melawi on the west, the Barito on the south, and the southern tributaries of the Mahakkam, on the east coast. Ascending the Kapuas to the mouth of the Mandai, the journey was pursued in small boats, through a flat, uninteresting and tiresome country, until the rapids were reached.

At Nanga-Raun, the next stopping place, reached in five days, they built a roomy hut. In that mountainous region, Herr Büttikofer chose for exploration Mt. Liangkubung. About 2,500 feet up its side he camped in one of the dry grottoes, inhabited by large numbers of the native Punans, and there remained from the 10th of March to the beginning of May, 1894.

The hunting, while rough and tiresome, gave excellent results, and many new specimens were procured, such as the *Sciurus whiteheadi* and the *Calyptomena hosei*, heretofore only known in north Borneo. Fresh foot prints of the rhinoceros were also seen; on the summit the only evidence of life in the grave-like silence was the forest blood-leech, the pest of the mountain climber in Borneo, which fell upon them murderously.

Returning to Poetoes Sibau on the 5th of May, Büttikofer and party went up the Sibau as far as Poelau, the only settlement in the whole Sibau valley, and again returning to Poetoes Sibau, joined Dr. Nieuwenhuis and Professor Molengraaf in the journey to the Mahakkam region. Concluding his *résumé* of the various journeys he remarks: "I confined my work to the region of the upper Kapuas, under the equator, because of the isolation of the district and the ignorance concerning it, and as a result I lack many specimens of species belonging to the coast."

The mammalia and birds of Borneo can best be compared with those of the known islands of the East Indian archipelago, and I have, therefore, few new specimens, although working in an entirely unknown region. This demonstrates that the fauna of the Kapuas region is identical with the Sarawak and upper Borneo. I am of the opinion, as a result of my observation, that the lateral diffusion of animals is of much greater interest than the altitudinal, and that this observation can be used to illustrate the speculative theory of the elevation and depression of the Malay archipelago and the island of Sundain.

While Borneo, from a zoo-geographical point of view, resembles Java and Sumatra and the adjacent islands, as well as the peninsula of Malacca, it nevertheless shows a constant tendency to deviate. For a good classification of the mammalia of Borneo we have to thank an Englishman, Mr. Chas. Hose, who gives 146 species, of which he has collected the greater part. The number found by me in the Kapuas region is about 66, divided as follows: Apes and Lemurs 12, Bats 18, Insectivora 10, Carnivora 7, Rodents 13, Artiodactyls 3, Perissodactyls 2, Edentates 1.

Among the mammalia the greatest interest centers on the orangutan, which is met with in the mountain region dividing Dutch

Borneo from Sarawak. It seems to avoid the valley forests as well as the higher altitudes, the central region of its dispersion being between Sambas and Batang Lupar-Seen. There they are so plentiful that Moret, who after my departure hunted for them to gather embryo material, found in that region alone 139 specimens in 3 months. How far north this distribution reaches cannot be ascertained from Mr. Hose, who himself does not seem to have met them. I conclude that the northern limit of distribution is not above southern Sarawak.

Eastward the distribution is limited, and it is not found east of Batang Lupar-Seen, and to the Sibau-Djaks it is only known by name. At the sources of the Kapuas it is not found. The cause of this limited distribution is not obvious, for the region of wild figs and similar fruit greatly exceeds its range and the climate does not vary. Another region in which it is found is the great alluvial plain of south Borneo, where it inhabits the swampy forests as far as the coast. The numerous specimens in the Leyden museum came from this region. Their color varies from a dusky red to a russet brown.

The attempt has been made to separate the dark varieties into a distinct species to which the name *Simia morio* has been given.

The orangutan lives exclusively in the tops of the trees and in his search for food covers a large territory; it does not like the gibbons, which are much more active, swing itself to a great distance, because of its great size, and is sometimes forced to descend. After eating it can be hunted with great ease by a practiced shot, but unless mortally wounded or shot in the arms it is impossible to bring it down. If a mother is shot with her young by her, the latter can be easily captured and readily tamed. The habit of the *Maias* (which is the Djak name of the orang) is to build itself a nest which he uses at night.

In the forests of the Kenepai, where it is often met with, we found so many of these nests that I am convinced that it does not occupy the same nest every night, but builds them when necessity requires. They are about the size of an eagle's nest, and are often found on small young trees; and not much skill or pains or uniformity of design is shown in building them.

The gibbon is much livelier and lives in small communities of five or ten individuals; it by preference inhabits the mountain forests, and I have found it at an attitude of 900 metres, while in the river valleys it is seldom found. They rush through the forest with great noise and crying, swinging from tree to tree; the Djaks call them *mblian*. The varieties are two, light and dark; the former named *Hylobates concolor*, the latter *H. Müllerí*.

The proboscis monkey has his home on the banks of the rivers and never ascends the mountains. I found them near the mouth of the Palin river as it flows into the Kapuas. They live in small families of 5 or 8 and are not at all shy; a living specimen I obtained was quite white, and his nose was just a little elongated.

A very pretty animal is the lemur (*Nycticebus tardigradus*), most plentiful in the lower Kapuas, but not found much above Sintang; of these I collected several living specimens. The tarsier (*Tarsius spectrum*) is not rare in the lower river regions and is brought living, for sale by the Malays. On the day of my arrival at Pontianak, I bought a flying lemur (*Galeopithicas volans*), which I kept alive. Of the insectivora the *Tupaias*, or tree shrews, are most numerous. The *Gymnura alba* is much rarer and more interesting. The Malays, because of its nocturnal habits and appearance, call it *tikus bulan*, which means moon-rat; in color it is a dirty white with a stiff, spindle-shaped, naked tail. In the daytime it lives among the roots of the trees and burrows

in the ground, and is easily located by its musky odor.

The seven carnivora in the Kapuas region, with the exception of one cat, one otter, and the Malay bear belong to the civet cats and the *Ichneumons*. Of the 13 rodents the squirrels are the most numerous, and among them are two very pretty species, *Sciurus melanotis* and *Sciurus whiteheadi*. In the same locality we found the giant of the squirrels, *Rheithrosciurus macrotis*, which lives on the ground and is distinguished by a large bushy tail, and which is universally distributed over Borneo, but is nowhere plentiful. We also found flying squirrels and on the Kenepai a small species of porcupine

Of the artiodactyls, the deer family has three specimens — the sembar (*Cervus equinus*), the muntjac (*Cervulus muntjac*), and the small musk deer (*Tragulus kanchil*); all are common in the Kapuas region and are caught by the natives. I have already mentioned the Rhinoceros; the remaining animal is the bearded pig (*Sus barbatus*), which lives on the shores of the Kapuas and is very numerous. His food is preferably earth worms, which are so plentiful that in poling in the mud of the river one pulls out more worms than earth. Because of his light skin and scanty hair the wild pigs appear white. In closing Herr Büttikofer calls attention to the preponderance of the arboreal animals, and states that of the 66 species found by him 52 are arboreal. "This preponderence is not found elsewhere in similar geographical conditions, either in Celebes, Africa or America; a preponderance which cannot be due to the priority of beasts of prey living upon the ground, for, as has been shown, they play no part in Borneo, and the tiger is unknown. It must be due to the forest covering of the island and to the yearly floods."

This imperfect *résumé* of Herr Büttikofer's paper will, perhaps, suffice to indicate its value to the zoologist and to suggest to the layman its romantic interest. We shall anticipate the pleasure of reading the forthcoming report which is to contain the combined results of the Borneo expedition.

GEORGE R. STETSON.

WASHINGTON, D. C.

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*SEMON ON THE MONOTREMES.**

AMONG the contributions to zoological literature which have appeared in the reports of Dr. Richard Semon's expedition to Australia and the Malay Archipelago, perhaps none have more popular interest than the papers by Dr. Semon himself on the habits and development of the Monotremes.

Both *Echidna* and *Ornithorhynchus* were studied. In neither of these animals is maturity attained until the end of the second year. The male *Echidna* is considerably larger than the female. In both genera the testes increase greatly in size during the breeding season, and the female *Echidna* develops a marsupium which disappears when no longer required by the young. The breeding season of *Echidna* begins late in July, and *Ornithorhynchus* commences to breed a little later, or about the middle of August. A striking ornithic character is that eggs from only the left ovary are fertilized, although the right ovary and oviduct appear to be well developed. The usual number of ova is one in *Echidna* and two in *Ornithorhynchus*. The egg is fertilized before or about the time of its entrance into the oviduct, and is at this time about four millimeters in diameter and nearly spherical, but during its sojourn in the genital passages a shell, composed of keratin, is secreted, and the egg (in *Echidna*) increases in diameter to about fifteen millimeters by absorption of uterine secretions. Both animals are oviparous, and in *Echidna*

* Zoologische Forschungsreisen in Australie und dem Malayischen Archipel. Von Dr. Richard Semon. Zweiter Band, I. Lieferung. Jena, 1894.

the single egg is transferred by the mother to the temporary marsupium, where the young are hatched, the period from fertilization to hatching being about ten weeks. *Ornithorhynchus*, being an aquatic animal, develops no marsupium, and the eggs are said to be deposited in the burrow which the animal constructs, but upon this point Semon made no observations.

Most of Semon's studies of the development were upon *Echidna*. The Monotreme egg is strictly telolecithal, resembling the eggs of Sauropsids in many points. The four-celled stage shows two vertical cleavages at right angles, the blastomeres being exactly equal. Quite early in development the blastoderm is seen to consist of a layer, one cell in thickness, except near the middle, where a few cells lie deeper. These were called hypoblast by Caldwell in 1887, but Semon regards this apparently two-layered stage as a morula, since he finds that the blastoderm later resumes the one-layered condition which he calls the blastula. In the mode of gastrulation the Monotreme egg suggests the Anamniotic type, the invagination preceding or accompanying the formation of cænogenetic entoderm, instead of following it as in Sauropsids and Mammals generally.

Late embryos of *Echidna* show external genital knobs, which become enclosed within the cloaca before the time of hatching.

Among observations on the fœtal membranes may be mentioned the persistent union of amnion and serosa (chorion), which is very similar to the condition described in Chelonia by Mitsukuri. During the latter half of the embryonic period the body lies between the allantois on the right and the yolk-sac on the left, the two structures being, for a time, of nearly equal size. The inner walls of the allantois become adherent, obliterating its cavity, except near the middle, while the outer surface, which is very vascular, unites with the chorion and serves undoubtedly as a respiratory organ, as in Sauropsids.

Some very interesting notes on the body temperature are recorded, which show that it bears no direct relation to season, age nor temperature of the external air. Temperatures taken in the cloaca, varied from 26.5° C. to 34° C., so that the Monotremes are in a sense midway between the so-called cold-blooded and warm-blooded animals in regard to body temperature.

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NOTES ON FRENCH GEOGRAPHY.

PAYS DE BRAY.

The even skyline seen in looking across from either side of the *vallée de Bray* between Neufchatel and Bauvais, in northwestern France, is a most marked feature in the landscape. One rides over the even chalk upland to come suddenly upon the crest of an escarpment that descends steeply before him. He there looks across a lowland and sees a similar escarpment ascending upon the farther side, whose elevation above sea-level is about the same as that of the crest upon which he stands. After descending and crossing the different formations with varying structures appropriate to the half dome, cut off on the east by a series of faults which is the main structure of the Pays de Bray, he ascends the other side of the lowland and finds himself again on a Chalk upland exactly like that which he left. One at first sight might suppose that here is the uncovered base of a dome which had been baseleveled and later covered by horizontal Cretaceous beds. The exceedingly level skyline lends countenance to this view, but even a hasty inspection of the region shows that this is not the case.

The production of the even upland is subsequent to the uplift of the half-dome, which once must have risen higher than the present upland. Two reasons for this are

as follows: The Chalk, although nearly horizontal, sympathizes with the arching of the Portland oolites in the Upper Jurassic, the Lower Cretaceous, and the Gault series, which formations make up the half-dome as at present revealed by denudation; and the Chalk is also faulted with the other Mesozoic rocks.* The second reason for regarding the remarkably even upland of the Chalk as produced by baseleveling after the up-arching and faulting is found in the arrangement of the surrounding streams. The drainage to the southwest of the half-dome, which is the side where the arching is but little broken by faults, likewise shows the influence of the dome form during the initial stages of dissection which followed the uplift of the region. The radiating arrangement of the streams, la Varenne, Cailly, Robec, le Heron, Andelle and Eple indicates initial and consequent courses upon the western side of the half-dome.† Subsequent branches of the Eple and Bethune have discovered the weaker members of the Pays de Bray half-dome. In a word, the whole drainage system of the region between the Seine and the English channel is in accordance with what one would expect to find upon an area including a baseleveled half-dome, slightly elevated and dissected to youth or adolescence in the second cycle. Moreover, the adjustment of the drainage to the structure of the half-dome is so perfect that one cannot believe that the elevated region was a gently sloping coastal plain upon whose surface consequent streams became superposed upon a baseleveled and buried half-dome. The amount of dissection in the present cycle is not sufficient to allow of such perfect adjustment of stream to structure as we find to-day in the Pays de Bray.

* See *Le Pays de Bray*, by Professor A. de Lapparent, Paris, 1879, pp. 11, 116, 141.

† See Neufchatel and Rouen sheets, Nos. 20 and 31, Carte topographique de l' Etat-Major, 1 : 80,000.

BLIND VALLEYS AND SINKS.

IF one goes westward from the Pays de Bray, across the exceedingly level upland to the cliff above the straight shoreline of the English channel, where the coast has been developed to maturity by the vigorous action of the Atlantic waves cutting into the Cretaceous rocks, he will find remnants of drainage systems left upon the edge of the upland. These remnants appear to have been branches of a river that was situated where the English channel now is found. The remnants are evidently cut by flowing streams of water upon the surface of the land, though at present the valleys descend gently toward the cliff and there precipitously pitch into the ocean,* and thus evidently depart from the grade of a normally developed one-cycle stream.

In marked contrast to these evident subaërial remnants are the blind valleys seen upon the surface of the upland between the Pays be Bray and the coast, similar to those described in Austria.† One enters a small valley and follows it down for some distance seeing nothing in its form to lead him to suppose that it is anything but a normal branch of some river system. All at once he comes upon a plain area opening out from the comparatively narrow valley. The plain is a sink, surrounded on all sides by higher land sloping gently toward its center.

A typical young form of sink with three blind valleys beginning to develop, working back slowly from the central hole, is shown by M. Mantel in the plan of Mas Razals.‡ Slightly older forms are figured by the same writer at Aven de Hures, Igue de Baou, Igne de Planagreze and Pouor de Cettinje.§

* See French map 1 : 80,000; St. Valery, Abbeville, Yvetot sheets, Nos. 10, 11 and 19.

† Tietze. Jahrb. k. k. geol. Reichsanstalt, XXX., 1880, 738; Supan. Kirchhoff's Landerkunde von Europa, 1(2), 1889, 288.

‡ Les Abimes, Paris, 1894, p. 184.

§ Loc. cit., pp. 225, 302, 335, 486.

MM. de la Noë and de Margerie have shown similar forms in eastern France north of Besançon.* The combination of blind valleys and sinks gives various forms; the greater the number of subterranean passages for the water, the greater will be the irregularity of the surface. The simplest type of a blind valley is found where a single valley gently descends on a continuous grade to a flat depression of little or no greater width, under which is the subterranean outlet for the water. The method of formation of the passages below the surface of the Chalk is discussed in the chapter on subterranean water in Mantel's Les Cevennes (Paris, 1890) and in his Les Abimes.

MARAIS DE SAINT GOND.

Map of France, 1: 80,000, sheet 50. Chalons, S. W.

Upon a recent trip up the valley of the Petit Morin, toward the open Champagne, it was observed by the writer that the floor of the valley that trenches the Tertiary upland was aggraded for the whole distance from a point a few miles west of Montmirail (sheet 40) up to the head of the St. Gond marsh. There are places where the valley sides approach each other more closely, leaving a narrower aggraded bed, thus indicating more resistent layers in the Lower Tertiary or Upper Cretaceous strata, and hence harder work for the Petit Morin-Somme-Vaure when it was cutting the valley, now aggraded, before the capture of the headwaters by the Soude.† Professor Davis has shown that the diminished volume of water in the Petit Morin would necessitate aggradation. The smaller amount of water is not able to carry off the same amount of detritus which is still washed down from the same slopes. The soil creeps down, the storms wash much fine detritus from the slopes into the valley bottom, and the small side streams, which now are as able to do the work given them as before the capture of the headwaters of the Petit Morin, also carry much waste into the valley. At the western end of the marsh, near St. Prix, the little side stream entering here from the north has brought in considerable detritus, but this is only one of the minor factors in the production of the Marais de Saint Gond.

The Petit Morin has lost the greater part of its drainage area. It had developed a good-sized adolescent valley, particularly broad east of the hard rocks which form the great Tertiary escarpment of the Paris Basin. Since the loss of its headwaters it has been compelled to aggrade throughout the greatest portion of its course, thus causing many small swamps in the lower narrow valley and a broad marsh, le Marais de Saint Gond, at the upper limit of the beheaded Petit Morin. The present condition is one of unstable equilibrium. The small stream at the elbow of capture of the head waters of the Petit Morin by the Somme-Soude, in the small village of Ecury-le-Repos, will soon cut through the low divide, on account of the steeper grade of the Somme, and will drain the Marais de Saint Gond near the village of Morains.*

THE AGGRADING BAR.

The little wriggling bar staggering blindly along in a broad meandering valley is like a small boy attempting to fill his grandfather's boots. The waste supplied from the sides of the adolescent valley, cut by the ancestor of the present stream, is much too great a load for a little brook. Beneath the recent deposits of the bar, Professor de Lapparent has found, by means of excavations lately made, a deposit of argillaceous green sand, which must have been transported from the basin of the Aire when

*See fig. 1 in Les Formes du Terrain.

†See the Seine, the Meuse and the Moselle, by W. M. Davis, Nat. Geog. Mag., VII., 1896, 197-202.

*See Atlas Cantonal, Département de la Marne, 1: 50,000, sheet No 5, Canton de Vertus.

that stream was a tributary of the Meuse and flowed through the valley now occupied by the beheaded bar.

This geological confirmation of the geographic interpretation of the river captures in this region made by Professor Davis* is interesting on account of the reversal in the order of the observations from those made in the case of the capture at Toul.† That the present upper Moselle formerly joined the Meuse was first argued from the presence of pebbles in the valley of the Meuse which must have come from that of the Moselle above Toul. The strong geographic argument from the form of the valleys later corroborated the geologic evidence. Now we have the geologic added to the geographic evidence for the turning of the Aire by the Aisne from the drainage system of the Meuse to that of the Seine.

One of the sources of the present Bar has been turned by man recently, so that it now increases the water supply of the Briquenay, the reversed portion of the subsequent Aire-Bar. This change of a watercourse for industrial purposes is a continuation of the work begun by nature. The broad aggraded floodplain of the Bar is being taken advantage of this year, and a railway has been constructed along it between Sedan and Vouziers, with a branch running to Buzancy.

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CURRENT NOTES ON PHYSIOGRAPHY.

IS GREEN RIVER ANTECEDENT TO THE UINTA MOUNTAINS?

A RECENT paper by J. D. Irving ('Stratigraphical relations of the Brown's park beds of Utah,' Trans. N. Y. Acad. Sci., XV., 1896, 253–259), says: "It is a fact no longer disputed that these deep cañons in the quartzite by which Green river crosses the Uinta mountains were first established in the softer overlying formations, and that these formations furnished much of the corrosive material by means of which the harder rocks were cut away." It is not clear whether the overlying formations here mentioned were higher members of the Uinta arch or unconformably overlying Tertiaries. If the former, the writer would support Powell's explanation of the antecedent origin of the river; if the latter, he would support Emmons' view that the river is of superposed origin. In either case discussion on the question is hardly closed. Indeed, considering how frequently the Green is referred to as an antecedent river, it is remarkable that so little attention is given to the doubts that have been expressed regarding that manner of origin and to the difficulties that such an origin involves. Two recent text-books on geology credit the antecedent explanation. Tarr says: "In some cases the uplift of mountains appears to have been so slow that rivers have been able to maintain their courses across them as they rose; at least this is the interpretation placed upon some rivers, such as the Green river of Utah, which cuts directly across the high Uinta mountains' (Elementary Geology, 1897, 319). Scott is more cautious: "A famous example of what many authorities believe to be an antecedent stream is the Green river in Wyoming and Utah. Entering from the north, the river cuts its way in a winding course through the great mountain barrier of the Uintas in a remarkable series of cañons. This explanation is not accepted by all the observers who have examined the region; some of them explain the phenomenon by the theory of superimposed drainage" (Introduction to Geology, 1897, 325).

The Green river was unquestionably laked by the uplift of the Uinta range, and to this extent it is a defeated and not an

*Loc. cit., p. 232.
†Loc. cit., p. 228.

antecedent river. Between its two meridianal portions, north and south of the range, the river makes a great bend to the east, turning from the higher towards the lower part of the uplift—a remarkable coincidence, if this was an antecedent turn. It should further be noted that argument by which the antecedent origin of the Green was first supported, involved a similar origin for a number of smaller streams, although there can be little question that most or all of the latter are the result of headwater erosion along the strike of weak strata. Finally, the antecedent origin of the Green gives no adequate explanation to the broad depression of Brown's park near the eastern end of the mountains and chiefly within the rimming ridges. The paper by Irving, above named, explains the Brown's park beds as due to a lake formed by a slight uplift which dammed the river, but gives no consideration to the origin of the park itself. This, as well as the origin of the river, deserves careful study, in view of the frequent reference made to the region in geological writings. As the problem stands to-day, the Rhine in its gorge through the Schiefergebirge, in its middle course, is a better proved example of an antecedent river than the Green in its canyon through the Uinta mountains.

SANTA CATALINA ISLAND, CALA.

A study of this interesting island has been made by W. S. T. Smith (Geology of Santa Catalina Island, Proc. Cal. Acad. Sci., I., 1897, 1–71), following a brief description of some of its physical features by Lawson three years ago. It is gratifying to see that Smith recognizes as a chapter of geology the processes of taking away as well as those of giving; the work of denudation as well as that of deposition. Both these processes are plainly involved in any discussion of geology as a matter of earth-history, although it has often enough been the fashion to treat the 'geology' of a region as if it were concerned with composition, structure and deformation alone, giving only the briefest attention to denudation. Certainly, old mother earth has been about as much occupied with the latter as with the former, and our attention might be equally well distributed. Whether this chapter of geology shall be called geomorphogeny or geomorphy, or whether it affords appropriate material for these notes, is a less important matter.

Santa Catalina is regarded as a block broken from a much greater area of deformed basement rocks when the region was part of the mainland. Since then it has been dissected, partly covered with lavas, depressed so as to form an island, and the still emerged part denuded almost to a peneplain; then elevated, again dissected, and again depressed. The argument leading to this succession of events is well sustained. At present the shores are rapidly cut back by the sea. The gap in the island ridge where drowned valleys enter from either side, forming bays with with beautiful concave beaches, is explained as a local sag or structural depression.

NOTES.

Further account of the Lammbach disaster on the north side of Lake Brienz, Switzerland (see Science, Jan. 1, 1897), is given by C. Schmidt, of Basel (der Murgang des Lammbaches bei Brienz, Schr., Gesellsch. Urania, Berlin, no. 43, 1896), with a number of excellent illustrations. Most peculiar is the abrupt termination of the stony flood at certain points, where its margin resembles that of a thin lava flow.

The Geology of the Fox Islands, Maine, a dissertation by G. O. Smith, of Johns Hopkins University (1896), includes a brief account of their geography. The islands are hills rising over the broad floor of the

half-drowned Penobscot valley. Small modifications of form are ascribed to glacial action. The processes of to-day cut back the salients and fill the re-entrants of the shore line.

'GLACIAL flood deposits in the Chenango Valley,' described by A. P. Brigham (Bull. Geol. Soc. Amer., VIII., 1897, 17–30), are good examples of forms produced by the constrained drainage of the retreating glacier, passing from the Mohawk valley, over a divide and through the plateau country on the south, to the Susquehanna.

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CURRENT NOTES ON METEOROLOGY.

WINTER STORMS ON THE COAST OF CHINA.

Two noteworthy publications come to us from the Shanghai Meteorological Society. They are the 3d and 4th Annual Reports of that Society, and were prepared by Rev. S. Chevalier, the energetic President of the Society, and Director of the Zi-Ka-Wei Observatory, at Shanghai. The first is entitled an 'Essay on the Winter Storms of the Coast of China,' and the second, which is really a part of the same investigation, concerns 'The Variations of the Atmospheric Pressure over Siberia and Eastern Asia during the Months of January and February, 1890.' Both of these monographs furnish valuable information concerning the meteorology of the eastern coast of China. Among the results of Father Chevalier's study we note the following: The cyclones which travel across Europe and reach western Siberia experience great difficulty in crossing this region, and are generally driven off towards the North Pole by the anticyclone over Siberia, but some may cross the whole of Asia directly from west to east, or else may be deflected to the southeast towards China. These depressions over Siberia affect the weather on the coast of China indirectly. There are, in addition, cyclones developed over China or further west, which cross the Chinese coast with an east or northeast movement, and it is such cyclones as these that precede the winter storms on the coast of China. The gale in these storms bursts more or less suddenly after the passage of the center, and depends for its violence on the depth of the depression, as well as on the height of the succeeding cyclone in the rear.

THE 'ILTIS' TYPHOON.

THE somewhat remarkable typhoon, which resulted in the loss of the German gunboat 'Iltis,' with all her officers and the majority of her crew, during the night of July 23–24, 1896, in the neighborhood of the Shantung Promontory, on the coast of China, has been made the subject of a special study by Rev. Louis Froc, S. J. The results are published by the Zi-Ka-Wei Observatory in a monograph entitled 'The Iltis Typhoon, July 22–25, 1896.' The conclusions reached by the author are interesting. He says: "There is never any advantage in undertaking a struggle with a typhoon. Even with the powerful forces which our great steel liners carry within their breast, prudence is yet in this instance a good adviser, and a safe anchorage is far better than the risks of a wrestle; no time is gained thereby, and the vessel is exposed, if not to a fatal loss, at least to serious damages. Several steamers (in this typhoon) were kept back, despite the force of their engines, in the neighborhood, or even drawn in towards the center of the hurricane." The swell from this typhoon was noted 500 miles in front of the advancing center. There was a marked fall of the barometer 310 miles from the center, and the lowest pressure recorded was 27.97 inches.

ANGOT'S 'THE AURORA BOREALIS.'

AN English translation of Angot's 'Les Aurores Polaires' appears as Vol. LXXVII.

of the International Scientific Series (D. Appleton & Co.). This book has already been reviewed in SCIENCE (Vol. II., 107–108), so that extended comment on the translation is not necessary. The volume presents an interesting and complete account of the aurora in all its aspects, and will prove a valuable addition to scientific libraries. We note that the title page and cover give the title as 'The Aurora Borealis,' while the headings on the even pages all through the book give it as 'The Polar Aurora.' There are several illustrations of different forms of the aurora, but we do not find any index.

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CURRENT NOTES ON ANTHROPOLOGY.

THE JEWISH PHYSICAL TYPE.

THE peculiar physical type which we call 'Jewish' is as easily recognizable in the sculptures from Tello and Nippur, carved two or three thousand years before the Christian era, as it is in the satirical comic papers of our own day. The most prominent trait is the nose, which has the curve of an italic figure *6* reversed.

This is sometimes called the Semitic type, but erroneously, as the purest Semites, the Arabians of the desert, do not exhibit it. We must, therefore, seek its origin elsewhere. In an article read before the Munich Anthropological Society, printed in the *Correspondenzblatt* for January, Professor Oberhummer agrees with von Luschan in attributing it to the ancient Anatolian people, probably of Caucasic (Alarodian) affinities, residents in Armenia before the Aryan Armenians possessed the land, and whose branches were the Elamites and Susians of the south. These, by intermarriage with the Semitic invaders, impressed upon them this physical type, though not their language or culture.

This theory does not fully explain the prevalence of this type in Palestine, unless we allow a larger intermingling there of foreign blood than has been customary with historians.

ON WAMPUM RECORDS.

THE last scientific contribution prepared by our late eminent colleague, Mr. Horatio Hale, is printed in the *Journal of the Anthropological Institute* for February, 1897. It is entitled 'Four Huron Wampum Records; a study of Aboriginal American History and Mnemonic Symbols.' His usual patient research and careful deduction are well exemplified in it. The manufacture of wampum, its earliest use as a form of record, and the origin and meaning of the symbols woven into the belts, are fully discussed. Much collateral information on the history of the Hurons and Iroquois and on the formation of the famous 'League' is added.

A note is appended by Professor E. B. Tylor, which reviews Mr. Hale's conclusions and suggests further lines of research relating to the subject. He argues that the wampum *belt* had its origin among the Iroquois.

The studies on this question are yet far from completeness, as wampum was merely a method of arranging beads for mnemonic symbols, a custom widely prevalent in savagery and branching in many directions.

THE OTOMIS.

ACCORDING to the traditions of the Aztecs, their predecessors in Central Mexico were the Otomis, an undersized dark people, described as stupid and barbarous and speaking a tongue most cacophonous and difficult. Many thousands of them still survive on the Mexican plateau, but our actual knowledge of them is very scant.

A few years ago Judge Eustaquio Buelna published a grammar and dictionary of their language, composed by a Jesuit mis-

sionary about 1770 ('Luces del Otomi,' pp. 303). We have others, but it is one of the most valuable, and is carefully edited.

The assertion has been several times advanced by Mexican writers that there is a relationship between the Otomi and the Apache, that is, the Athapascan stock. I made a careful comparison of one hundred test words between the two groups, and sent the results to the Congress of Americanists at Stockholm, but I am informed that the paper has been lost. It showed that a sufficient number of verbal similarities exist to render either linguistic relationship or admixture probable.

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NOTES ON INORGANIC CHEMISTRY.

IN a recent number of the *Comptes Rendues* P. de Wateville describes a method of growing crystals with a transparency and luster analogous to those of cut and polished stones. The small crystal is so mounted that while growing in a saturated solution it can be continuously rotated on itself with a speed of several rotations a second. In alum crystals thus grown at 50°, dodecahedron and cube faces progressively disappear, those of the octahedron alone finally remaining. Potassium and ammonium alums, copper sulfate and sodium chlorate are said by the author to give particularly fine results.

IN the *American Chemical Journal* for April Professors Jackson and Comey, of Harvard, describe a peculiar hydrogel formed by the action of nitric acid on potassium cobalticyanid. When a strong solution of the latter salt is boiled with an equal volume of concentrated nitric acid for two hours it suddenly changes into a dark red semi solid gelatinous mass. This jelly is insoluble in acid or salt solutions, but somewhat soluble in cold or boiling water, and more so in water at 60°. This solution can be evaporated without gelatinizing, and the residue from evaporation when moistened with water decrepitates with a series of insignificant explosions to a red powder, almost insoluble in cold water, but somewhat soluble in water at 60°. The formula from analysis is $KH_2Co_3(CN)_{11},H_2O$, provisionally called monopotassium cobaltocobalticyanid. Several other salts (barium, silver and copper) of the acid were made. A similar jelly has been formed by the authors by the action of nitric acid on potassium ferricyanid. On boiling potassium ruthenium nitrosochlorid, K_2RuCl_5NO with potassium cyanid in quantity insufficient to convert it into the ruthenocyanid, the writer has obtained a similar hydrogel with almost identical properties.

ACCORDING to the recently published report of the Russian Department of Mines for 1895, the production of platinum for that year was 9,700 pounds, a decrease of 1,700 pounds from that of the year preceding. The production of all other mineral products showed a decided increase, except that of gold, which decreased slightly. The largest relative increase was in mercury, the production of which, 500 tons, was more than twice that of the previous year.

J. L. H.

SCIENTIFIC NOTES AND NEWS.

AT a meeting of the Academy of Natural Sciences of Philadelphia, held the 13th inst., the following was unanimously adopted: The Academy of Natural Sciences, of Philadelphia, has received, with profound sorrow the announcement of the death of Professor Edward Drinker Cope. It is fitting that this meeting should place on record a minute expressive of its sense of the loss sustained. The Academy witnessed the beginning and the end of his long labors. It was to its halls he came as a student in 1859 and it was to them he paid his last visit before his final illness. The lustre thrown upon the society by his researches is but a reflex of the spirit of this remarkable man, who exibited,

in a way rarely equalled in the history of science, the consecration of a powerful intellect to the pursuit of the knowledge of nature. To an almost unerring accuracy of observation he conjoined admirable judgment. He was unexcelled as an expert in the field of vertebrate zoology of both present and extinct forms; he discovered great numbers of genera and species; he announced startling and epoch-making schemes of classification; he framed comprehensive systems of philosophy based on biologic premises. One hesitates which to admire the most, the tenacity of his memory, the brilliancy of his wit, or the ease with which he used his enormous erudition. To any community and at any time the loss of such a man is a calamity.

Mr. M. E. D. Trowbridge writes from Detroit that Professor F. W. Putnam, Permanent Secretary of the American Association for the Advancement of Science, visited Detroit on the 8th inst., in the interests of the meeting to be held in this city next August. He reported himself highly pleased with the facilities offered by the new high school building for the accommodation of the several sections of the Association. At present there is promise of a most successful meeting. Local committees are at work to provide interesting features for the entertainment of their guests. While in the city Professor Putnam spoke upon the Ruins of Copan, Honduras, under the auspices of the Detroit Archæological Society. There was an interested audience of 2,500 people. Professor Putnam was introduced by Professor M. L. D'Ooge, of the University of Michigan, President of the Detroit Archæological Society.

A conference was held on April 15th by Provost Harrison, of the University of Pennsylvania; President Schurman, of Cornell University, and President Low, of Columbia University, at the house of the latter, at which it was decided to ask Congress not to change the present law in regard to apparatus, books, etc. imported for public institutions. All the leading newspapers, Republican as well as Democratic, have protested against the imposition of a tax on science, literature and art, and it seems unlikely that the Senate committee will disregard this unanimous expression of public opinion.

Mr. H. Wilde, President of the Manchester Scientific and Literary Society, has given the Paris Academy of Sciences the sum of £5,500 to be used for an annual prize of 4,000 fr. for a discovery or publication in physical science. The prize is to be international. Mr. Wilde states that he has made this gift as a return for the benefit he has drawn from French science.

M. Radau, the astronomer, has been elected a member of the Paris Academy of Sciences in the room of the late M. Tisserand.

As we have already noted, the British Medical Association will hold its sixty-fifth annual meeting in Montreal, beginning on August 31st. The address of the President-elect, Dr. Roddick, will be on medical education in Canada. The address in medicine will be by Professor W. Osler, of Johns Hopkins University, and that in surgery by Mr. W. M. Banks, of Liverpool.

The Board of Managers of the New York Zoological Society held a meeting on April 13th at which the plans of the park were discussed and especially the methods to be used in collecting the needed $250,000. Several subscriptions of $5,000 and others for smaller amounts were made by the managers.

Professor Léon du Pasquier, of Neuchâtel, died after a brief illness on April 1st in his thirty-third year. He will be recalled by geologists as one of the most accomplished expert guides during the excursions offered in connection with the International Geological Congress at Zurich in 1894, and as author of a number of essays on the glacial geology of northern Switzerland.

Dr. G. A. Kenngott, professor of mineralogy at Zurich, died on March 14th, aged seventy-nine years. He had made important contributions to crystallography and petrography and was one of the editors of 'Handwörterbuch der Mineralogie, Geologie and Palāontologie.'

We also regret to record the deaths of Dr. F. W. Klatt, known for his contributions to botany; of Dr. Ludwig Hollaender, a writer on anatomy of the teeth; of Dr. Schols, professor of geology in the Polytechnic Institute at Delft; of Dr. Alfred Dewèore, the botanist; of Dr. Thollen, the geologist; of Dr. Ed. Freiherr

von Härdtl, astronomer at Innsbruck, and of Dr. Jacob Breitenlohner, professor of meteorology at the Agricultural School of Vienna.

AT a meeting held April 13th the Academy of Natural Sciences of Philadelphia conferred the Hayden Memorial Award for 1897, consisting of a bronze medal and the interest of the special endowment fund, on Professor A. Karpinski, the Chief of the Geological Survey of Russia, in recognition of the value of his contributions to geological and paleontological science.

PROFESSOR H. A. ROWLAND, of Johns Hopkin's University, has been elected an honorary member of the Royal Society of Edinburgh.

DR. GEORGE M. DAWSON, Chief of the Geological Survey of the Dominion of Canada, has been awarded the gold medal of the Royal Geographical Society of Great Britain, in recognition of his services in the surveys and maps of British Columbia, the Northwest Territory and the Yukon region.

ARRANGEMENTS are being made for the erection of a monument to Johannes Müller, in Coblentz, the place of his birth.

SIR JOHN EVANS, Treasurer of the Royal Society and President-elect of the British Association, has been elected a corresponding member of the Bologne Academy of Sciences in the room of Huxley.

DR. NANSEN lectured before the German Geographical Society on April 3d. The Society bestowed upon him the gold Humboldt medal. It was also announced that the Emperor had conferred on him the gold medal for science and art, 'the highest distinction which can be bestowed in Germany for peaceful achievements.' Dr. Nansen subsequently lectured at Copenhagen before the Danish Geographical Society, and received from the king the gold medal of merit with the royal crown.

LIEUTENANT ROBERT E. PEARY, now on duty at the New York Navy Yard, was detailed to Mare Island, Cal., by Secretary Long, but the order has been revoked at the request of those interested in the continuation of Lieut. Peary's Arctic explorations.

MR. ROBERT B. YOUND has been appointed Assistant Biologist at the Department of Agriculture, and will be assigned to work in Oregon and Washington.

THE daily papers report that the building of the College of Agriculture of the University of California at Berkeley has been burned, the loss being estimated at $400,000.

THE Governor of Florida has issued a call for a National Fisheries Congress to assemble at Tampa, Fla., on the 19th of January, 1898. The National Fishery Commission will take a prominent part in the proceedings, and the Governors of the different States are requested to send delegates. Governor Bloxham states that it is necessary to devise means to save from total extinction many varieties of valuable food fish.

THERE will be held an international fisheries exhibition at Bergen, Norway, from the 16th of May to September 30th of next year.

THE International Congress of Hygiene and Dermatology will be held in April next year, instead of this year, as was intended.

THE American Medico-Psychological Association will meet at Baltimore from the 11th to the 14th of May.

THE fifth International Congress of Criminal Anthropology will be held at Amsterdam in August, 1901.

THE New York Microscopical Society held its 18th annual exhibition on April 14th, at the American Museum of Natural History. There were nearly one hundred exhibits, which were examined with interest by a large number of visitors.

CHAS. SCRIBNER'S SONS announce the early publication of a series of volumes containing the 'Princeton lectures' delivered by distinguished foreigners during the week preceding the public sesqui-centennial exercises of Princeton University.

A NEW review for psychology and cognate subjects, including mental pathology, is announced to appear in Rome. It will be edited by a board of scholars, of whom Dr. Sancto di Sanctis, of the University of Rome, is to be Editor-in-Chief. Professor G. Sergi, the well-

known psychologist, is one of the directors of this review.

At the beginning of April a new American monthly entitled *Marine Engineering* was established.

Professor I. P. Roberts, Director of the Agricultural College, Cornell University, announces that the College has undertaken to assist teachers and parents interested in nature study by distributing, free of charge, leaflets giving instructions for the making of accurate observations of common objects.

An editorial article in *Garden and Forest* includes a letter addressed to the Secretary of the Interior by the committee of the National Academy of Sciences appointed to consider the forestry policy of the government, which outlines the report, which will shortly be presented. This letter states that the report now in course of preparation provides: (1) That authority be given to the Secretary of War to make details of troops to protect, until a forest service is organized, the property of the government; (2) That a permanent forest bureau be established; (3) That a commission be appointed to institute, under the supervision of the Director of the Geological Survey, topographical surveys of the reservations and determine what portions of them should be permanently reserved; and (4) to authorize the Secretary of the Interior to issue regulations for the protection of the reservations, for sales of timber, for entrance to the reservations, etc.

In *Science Progress* for April, Professor E. B. Poulton, of Oxford, prints, under the caption 'A Remarkable Anticipation of Modern Views of Evolution,' a note showing that Dr. James Cowles Pritchard, a distinguished pre-Darwinian anthropologist, anticipated by half a century the arguments urged by Weismann in favor of the non-transmission of acquired characters. This fact was brought to Professor Poulton's notice by Professor Mendola; and on consulting the work of Pritchard, entitled 'Researches into the Physical History of Mankind' (2d edition, 1826), Professor Poulton 'found that other important ideas are anticipated in it.' It throws an interesting side light not only upon the 'anticipation,' but also upon the attitude of Pritchard's mind toward the subject, that in a later edition of the work he cut out the passage. It is for this reason, Professor Poulton thinks, that the anticipation escaped the notice of 'Darwin and others,' who 'always went to the later edition.'

In an account of the work of the Lowell Observatory, for the last three months, published in the New York *Tribune* for April 17th, we are told: "Dr. Lee, who was in charge of the Observatory in the Southern heavens, announces that since January 1 more than three hundred thousand double and triple stars had been measured." Even for 'Dr. Lee,' from the vantage ground of an 'observatory in the Southern heavens,' this is doing finely—23 of them 'measured' per minute, day and night, more than half 'new,' as the *Tribune* tells us! We venture to suggest, however, that the *Tribune* is mistaken in stating that Sir John Herschel made larger additions to Southern stellar astronomy.' In his odd moments we are told that 'Dr. Lee' discovered 'many brilliant stars.' "In addition to these discoveries, his corroborative points of argument as to the formation of heavenly bodies will be exceptionally interesting—" the *Tribune* concludes.

A Reuter dispatch from Cape Town gives Dr. Koch's report on the rinderpest to the Secretary of the Agriculture Department, part of which is as follows: "I succeeded in immunizing within a fortnight several animals by means of a mixture of serum and virulent rinderpest blood to such a degree that they were enabled to withstand an injection of 20 ccm. of rinderpest blood, a ten-thousandth part of which is a fatal dose. From this fact I judge that the immunity of these animals is of a much higher degree, and I believe it is an active immunity equal to that of a beast which has contracted rinderpest and has then recovered. It is particularly important to know that only 20 ccm. of such serum are required to immunize one animal, and therefore one liter suffices for fifty head of cattle. A second and equally important fact is that one is able to render immune healthy cattle with the bile of such as have succumbed to rinderpest. In this case one hypodermic injection of 10 ccm. is sufficient. This immunity sets in on the tenth day at

the latest, and is of such an extent that even four weeks afterwards 40 ccm. of rinderpest blood could be injected without any injurious effect. I therefore conclude that the immunity produced in such a manner is of an 'active' nature. Rinderpest can be eradicated with but little difficulty and within a comparatively short time by putting these methods into practice. In infected parts nearly every case of rinderpest supplies a greater or less quantity of vaccine for those animals which are still healthy. I cannot but urge upon you the importance of bringing this method immediately to the notice of those cattle owners whose animals are suffering from or threatened by the disease." Dr. Koch offers to give a course of instruction at the experimental station at Kimberley.

DR. SCHLICH, C. I. E., professor of forestry at the Royal Indian Engineering College, Coopers-hill, read a paper at the Imperial Institute on Monday night on 'The Timber Supply of the British Empire.' Sir Stewart Colvin Bayley presided. According to the report in the London *Times* the lecturer said the average annual imports of timber into the several parts of the Empire during the years 1890–94 amounted to £19,135,000, while the exports averaged £5,114,000, showing that the net imports into the Empire reached the enormous sum of £14,021,000, an increase of £2,293,000 in six years, or a mean annual increase of £382,167. The United Kingdom was by far the greatest importing country within the Empire, having taken timber to the amount of £17,595,000 out of the total of £19,135,000. During 1894 the timber imported into Great Britain and Ireland from British colonies and dependencies was valued at £4,274,480, and foreign countries at £14,149,055. By far the larger portion of the timber imported into the United Kingdom came from Russia, Sweden, Norway, Germany, France and the United States, Canada being the only British dependency which at all equalled the export countries on the Baltic. Canada was estimated to contain 1,248,798 square miles of woodlands, but enormous tracts of that area did not contain any useful timber, while the remainder was by no means so well taken care of as it ought to be. Fires were frequent and disastrous, and the quantity of timber thus lost to the colony was calculated to be many times more than that cut down and exported. Notwithstanding those drawbacks, however, he believed that with proper management and careful conservation of the forests Canada might, at a moderate relative expenditure, supply the whole world for many years to come. He advocated the creation of a forest department in Great Britain, the careful conservation of existing and the creation of new forests by planting vacant lands, the establishment of schools of forestry, and model plantations for the guidance of private owners, and government grants in aid of those objects.

REUTER'S agent at Valparaiso, writing under date February 27th, gives particulars of Mr. Fitzgerald's expedition for the ascent of Aconcagua. The expedition of the Royal Geographical Society left Mendoza on December 7th last. There were, in addition to Mr. Fitzgerald himself, Mr. Vines, geologist; Mr. A. E. Lightbody, an engineer who joined the expedition at Mendoza; Mr. Philip Gosse, a naturalist, and Mr. Allan de Trafford, an engineer, with Mattias Zurbriggen, chief guide; Joseph Pollinger, second guide; Luis Pollinger and Lochmater, additional guides, and Zante Niccolo and Fritz Loribel, attendants. In order to climb Aconcagua they entered the valley of Horcones, where, at a height of 12,500 ft., a camp was pitched on January 7th. Another camp was established at a height of 14,000 ft., from which the actual ascent began. At the height of 18,000 ft. it was decided to plant on the side of Aconcagua the last camp. On January 15th Mr. Fitzgerald, accompanied by the chief guide, started for the summit, but at a height of 23,000 feet found himself unable to proceed. The guide went on alone, however, and on the afternoon of that day reached the highest summit of the mountain. Almost a month later, on February 13th, Mr. Vines also reached the top, after a journey of nine hours. Mr. Vines studied the geological structure of the mountain. The hillside, he said, is porphyritic and has a thick covering of argilaceous earth which cannot sustain vegetation. The south side is broken up into peaks. After the expedition

has made all the necessary observations of the formation of the mountain and the different heights, it will proceed to explore the mountain of Tupungato and also Mercedario, in the province of Coquimbo, which is nearly as high as Aconcagua.

UNIVERSITY AND EDUCATIONAL NEWS.

HARVARD UNIVERSITY receives $50,000 by the wills of the late Miss E. A. Haven and Miss C. M. Haven. Dartmouth College receives $15,000 from the same source, and Smith College $3,000 from Miss E. A. Haven.

MR. C. W. SPAULDING, lately Treasurer of the University of Illinois, is said to have used for his own purposes $400,000 in bonds and a large amount of money belonging to the University.

PRESIDENT DWIGHT, of Yale University, in his annual report recommends that the fiftieth anniversary of the Sheffield Scientific School, which occurs this year, be celebrated by suitable exercises. He states that a new building for the departments of physiology and morphology is needed and hopes that funds will be provided during the year. Gifts and bequests to the University during the last ten years have amounted to more than $4,000,000.

FROM the report of Cambridge University for 1896 it appears that during the year the University conferred 679 degrees of Bachelor of Arts, 33 of Bachelor of Law, 6 of Doctor of Science and 1 of Doctor of Letters. The total receipts of the University were upwards of £41,000.

WE stated recently that in nearly all cases the State universities had remained non-partisan. We must now record with regret the fact that the Populists, on securing a majority in the Board of Regents of the Kansas State Agricultural College, have dismissed a President who had served for eighteen years, to make room for a young man 'in harmony with the fundamental principles of the administration,' and have removed other members of the faculty and employees.

MR. JUNIUS MORGAN, a Princeton graduate resident in New York, who is known for his bibliographical collections, some of which he has recently contributed to the Princeton University library, has been appointed associate librarian in that institution. It may be added that the north stack room of the new library building at Princeton is nearing completion and the main collections are to be removed to it during the coming summer.

MR. W. B. MORTON has been appointed professor of natural philosophy in Queen's College, Belfast, filling the vacancy caused by the resignation of Dr. J. D. Everett.

PROFESSOR R. VON LENDENFELD, of Czernowitz, has been appointed professor of zoology in the German University at Prague. Dr. v. Below, of the Münster Academy, has been called to the chair of zoology at Marburg. Dr. Ludwig Heim has been appointed assistant professor of bacteriology. Dr. Gadamer has qualified as docent in pharmaceutical chemistry, at the University of Marburg.

DISCUSSION AND CORRESPONDENCE.

MR. LOWELL'S OBSERVATIONS OF MERCURY AND VENUS.

THE *Monthly Notices* of the Royal Astronomical Society for January, 1897, contains plates of drawings of Mercury and Venus, made by Mr. Lowell, at the Flagstaff Observatory, in 1896. The markings on Mercury were 'at once conspicuous' with the new twenty-four-inch object-glass; those on Venus are 'perfectly distinct and unmistakable.' The undersigned made a considerable number of observations of Mercury in the years 1873–1885, and a very large number of Venus in the years 1873–1890, with telescopes of six, sixteen, twenty-six, thirty-six inches in aperture, without ever once seeing markings of the character depicted by Mr. Lowell. Other markings of the class drawn by Schiaparelli and many other observers have, on the other hand, been seen and recorded whenever the conditions of vision were good. I have no hesitation in saying that such markings as are shown by Mr. Lowell did not exist on Venus before 1890. It is my opinion that they do not now exist on the planet, but that they

are illusions of some sort. Their general character* is what would be shown if the adjusting screws of an objective were set up too tightly, producing a set of strains in the glass, or if the objective were strained by its cell. Strains of this sort will sometimes produce faint companions to stars sufficiently bright. A comparison of all the drawings of Venus available in the library of the Lick Observatory is very instructive. All observers, except those at Flagstaff, see faint markings of one class, while those drawn by Mr. Lowell are of a totally different nature.

Venus has been observed on very many occasions at Mt. Hamilton, with our essentially perfect twelve-inch object-glass, in the years 1888–1897, without once seeing markings of the kind drawn by Mr. Lowell, or 'distinct' markings of any kind. Faint and indistinct markings, of the character of those drawn by scores of observers for a century past, are, however, seen when the circumstances are good.

The foregoing notes seem to me to throw doubt on the reality of the markings reported from the Flagstaff Observatory. Until Mr. Lowell's observations are fully comfirmed by other observers with other telescopes, it will be wise not to accept them unreservedly.

EDWARD S. HOLDEN.

MT. HAMILTON, March 9, 1897.

*Six or more radial rays, thicker at the outer rim of the image of the planet.

FURTHER CONSIDERATIONS ON THE SYSTEMATIC POSITION OF TARSIUS.

PROFESSOR HUBRECHT has replied with some warmth to the paper I lately published in SCIENCE, in which I attempted to show that, in my opinion, *Tarsius* is more of a lemur than an ape, although in reality an annectant type between the two. The objection I raised to placing *Tarsius* among the apes and the effect of this transferral on the classification of the Primates based on their osteology related to recent forms. Professor Hubrecht is probably quite aware that, when we introduce the fossil Primates into the question of classifying the recent forms, the apparently sharp lines of demarcation between the skeletons of recent lemurs and apes disappear.

I entirely agree with Professor Hubrecht in the idea that classification should be based as far as possible on phylogeny, and that the only truly scientific arrangement of animals depends upon a knowledge of their whole organization, both embryonic and adult. I claim, however, that the paleontological method in determining phylogeny is more nearly accurate than the embryological, as in the latter many characters are lost and innumerable cænogenetic variations are introduced which the embryologists often cannot distinguish from real homogenetic structures. The great number of phylogenetic trees based on embryology which are annually cut down is amazing, and in fact the truth of the theory of recapitulation as applied to the embryonic stages is now somewhat questioned.

I do not at all regret quoting the name of Francis Maitland Balfour in regard to his warning against placing too much reliance on placental arrangements as criteria for the classification of the Mammalia, and hold that it applies directly to the question of the systematic position of *Tarsius*. On this side of the Atlantic we do not all follow the Neo-Darwinians in believing that the germinal products are locked up in iron safes as it were, and not affected by external conditions as the rest of the organism.

I will now sum up my principal reasons for not accepting Professor Hubrecht's views that *Tarsius* is only related among the Primates to the Anthropoids:

1. It has not been shown as yet that the placenta in the lemurs is not a derivative of the chorion as in the apes.*

*M. A. Milne-Edwards remarks: "Or, l'allantoide des Indrisines est si facile à detacher des parties adjacentes, qu'il me semble peu probable qu'il ait laissé un de ses feuillets adhérent au chorion, et il y a tout lieu de penser que l'explication mécanique de la production du placenta, telle qu'elle a été proposée par M. Baer et Bischoff n'est pas toujours l'expression de la vérité, et que, dans certain cas au moins, l'arrivée des vaisseaux sanguins de l'allantoïde à la face externe du chorion provoque une hypertrophie dans les parties correspondantes du tissu de cette enveloppe fœtal, et que c'est de cette manière que se forme le placenta, et non à la suite de l'accolement d'une portion des parois de la vesicule allantoïdienne." Mammiferes de Madagascar, p. 284.

2. The diffuse stage of the placenta of some of the anthropoids is apparently directly comparable to that of the lemurs.

3. There is no fundamental distinction between a large free allantois and one which is rudimentary; it is merely a matter of degree and not one of kind.

4. There is no paleontological evidence as yet deduced which proves that apes and lemurs have arisen independently and that these two phyla were distinct as early as the Mesozoic.

5. The Santa Cruz beds of Patagonia in which *Homunculus* occurs are probably as late as the Lower Miocene.

6. *Anaptomorphus* of the Lower Eocene is much more closely related to the lemurs than to the apes, but it has certain anthropoid characters which indicate that some of the latter may have been derived from this genus.

7. Our present paleontological knowledge indicates that the Old World apes have been derived from a lemurine stock as late as the Oligocene.

8. Synthetic types as *Adapis*, *Tarsius* and *Mesopithecus* demonstrate that apes and lemurs are genetically related.

It remains to be seen whether naturalists in general will be willing to accept Professor Hubrecht's views as to the systematic position of *Tarsius*, depending upon the connection of placenta with the embryo (bauchstiel) and also on the histological details of the former. It seems probable that in forming an opinion as to the affinities of any animal the only judicious course to pursue is to consider the whole organization as well as the development. As far as I can learn from Professor Hubrecht's paper he has not followed this method, but wishes us to accept his conclusions hardly referring to the structures of *Tarsius* which are identical with those of the lemurs and which occur in no other mammalian group except the lemurs.

In conclusion I would like to call Professor Hubrecht's attention to the following passage from Burmeister's Monograph, which shows that he considered *Tarsius* to be a lemur, although Professor Hubrecht does not mention this fact in his memoir: "Aber Tarsius ist nicht mal ein Affe, er ist vielmehr nur ein Halbaffe, ein Mitglied jener Gruppe * * * * *; Darin unterscheidet er sich von allen übrigen Halbaffen und steht eben desshalb so isolirt unter ihnen da." It would be of interest if other morphologists would enter into this discussion and give their opinions as to the systematic position of *Tarsius*. If I did not state Professor Hubrecht's case thoroughly it was an oversight on my part.

Charles Earle.

New Rochelle, New York, April 7, 1897.

THE COMING ICE AGE.

To the Editor of Science: In Science of March 19th Professor G. Frederick Wright, in his notice of the Coming Ice Age, says that "he is not sure that he has comprehended the author's meaning." And it seems that such is the case where he writes that "the theory of the author is that a land conection between Patagonia and the Antarctic Continent, or a great diminution of the channel between these lands, would produce an effect upon the ocean currents favorable to the glaciation of both hemispheres." This description is so inadequate that it may produce a wrong impression, and so prevent a clear apprehension of what follows in the review. One of the main objects of my explanations has been to show that the closing or diminution of the channel south of Cape Horn would cause the tropical currents to enter the southern seas in sufficient volume to cause an age of mildness in the high southern latitudes which would spread over the globe, and the warm climate would continue until the southern oceans through a slow process retained water sufficient to greatly enlarge the channel south of Cape Horn, and so cause conditions favorable for the glaciation of lands situated in the high southern latitudes, such as is being performed to-day. Consequently, my prognostication of a coming ice age is based on the present enlarged condition of the Cape Horn channel, which affords sufficient space for the strong prevailing westerly winds of that latitude to force the surface waters of the southern oceans through the wide channel and so onward around the globe. Therefore, the

tropical surface currents setting southward are largely turned away from the antarctic regions, so only a scanty portion of the water from such currents reach the frigid latitudes. And through this cause the antarctic lands have become heavily glaciated, and the glaciers are constantly flowing into the sea. This process chills the waters surrounding the antarctic shores and causes them to sink and find their way to the temperate and tropical latitudes in under currents. In this way all of the under-waters of the oceans have acquired a low temperature, and there is much to show that their coldness is being slowly increased, and in consequence a cold epoch is being brought about. There is nothing hypothetical concerning the vast operations of nature which give support to this view of the subject. For it is well known to the navigators of the southern oceans that the belt of strong westerly winds which sweeps the southern seas causes a cold drift current to move around the Antarctic Continent. And it is also well known to science that the chilly waters of the antarctic seas find their way to the temperate and tropical latitudes in cold under-currents.

C. A. M. TABER.

THE SMITHSONIAN TABLE AT THE NAPLES STATION.

IN view of the necessary delay in connection with several applications which have recently been made for the use of the Smithsonian Table at the Naples Station, it may be well to call the attention of zoologists and botanists to the 'Report on the Memorial presented to the Smithsonian Institution regarding an American Table at the Naples Zoological Station,' printed in SCIENCE, XXI., No. 641, June 16, 1893, pp. 328–329.

Candidates will avoid delay in the consideration of their applications if they will bear in mind the following suggestions:

1. Applications should be addressed to Professor S. P. Langley, Secretary of the Smithsonian Institution, Washington, D. C., and *not* to the Secretary of the Advisory Committee.

2. The candidate should state his entire educational history, give a list of the papers he has published, and if possible send reprints of the same to accompany his application.

3. He should apply for a definite period of time, not exceeding six months, and state the time of year which will be most convenient for him to occupy the table.

4. He should give some definite statement as to the general line of investigation he wishes to pursue while at Naples.

5. If a recent graduate and a person not thoroughly known as an author, he should request his former instructors to write in his behalf to the Secretary of the Smithsonian Institution.

If the professors of zoology and botany in the various universities will bear these suggestions in mind they will greatly lessen the correspondence and delay in connection with the consideration of the applications from their students and will at the same time forward the interests of the applicants.

CH. WARDELL STILES,
Secretary Advisory Committee.

SCIENTIFIC LITERATURE.

An Introduction to Geology. By WILLIAM B. SCOTT. The Macmillan Co. 1897.

The author of this class-book has attempted, and we think successfully, to provide a brief but complete and sufficiently detailed treatment of geology for the ordinary college student.

He has used as a basis the fuller standard treatises on Geology, has taken as his model Sir Archibald Geikie's 'Class-book;' has written it for American students, selecting examples from American geology; has illustrated the work with reproduced scenes taken by American geologists, and has had help and suggestions from other workers in special fields. The result is, in general, a satisfactory book to put in the hands of a class of students, and particularly well adapted, as it seems to the writer, to supplement a course of lectures in a general college curriculum.

The arrangement of the chapters is not altogether such as a teacher would naturally use, and that some license is given to readjust the chapters is suggested by the remark in the preface: "The order in which the different sections of the book are taken up should depend somewhat upon the season of the year in

which the study is begun." The chapters themselves, however, treat of the subjects with precision and sufficient detail for the production of definite notions on the points discussed.

The treatment of Historical Geology is on the lines of Dana's Manual, but without the details. This method in an exhaustive manual is valuable, but it may be doubted whether the use of so many scientific names of animals and plants as is necessary in such a treatment conveys any definite information to readers who are unfamiliar with zoology and botany; and even to zoologists, unless very well acquainted with the paleontological side of their science. The fact is that a really satisfactory mode of treatment of this fascinating subject of the biological problems of historical geology has not yet come to light.

The illustrations are, in the main, excellent and new and, as has been said, richly American. But some of them are so imperfectly reproduced from the original photographs as to lose much of their value.

The publishers' part of the work is well done, though the user of the book will often be caused to lament that it is found necessary to put so much weight into a book one is expected to hold in a single hand.

H. S. Williams.

Yale University.

The Glaciers of North America. By Israel C. Russell, Professor of Geology in the University of Michigan. Boston, Ginn & Co. Pp. x+210.

When the glaciers of Switzerland had been well explored those in this country were scarcely known, and now Professor Russell tells us that North America is the best region in the world for the study of glaciers; that all types occur here, of all sizes and in great variety; and he makes good his assertion by the descriptions of the glaciers of North America, so far as they are now known, which fill the greater part of the volume before us.

Professor Russell attacks his subject as a geographer; his aim is to report the present condition of knowledge concerning the glaciers of this country and to 'stimulate a thirst for fresh explorations and renewed study along an almost untrodden path.'

To carry out this object the book must necessarily be largely a compilation, but the material for an important part is furnished by the original papers of the author himself. Of these we mention especially the account of the Mt. St. Elias region, which Professor Russell explored in the course of two remarkably plucky attempts to ascend Mt. St. Elias.

He opens with a chapter giving a clear account of the characteristics of glaciers and their work, in the course of which he is confronted with the question: 'What is a glacier?'

A concise definition of a class of natural objects is always difficult; and certainly none has yet been given which includes all the phenomena of glaciers. Mr. Russell recognizes this and gives provisionally the following definition: A glacier is an ice body originating from the condensation of snow in regions where secular accumulation exceeds melting and evaporation, *i. e.*, above the snow line, and flowing to regions where waste exceeds supply, *i. e.*, below the snow line.

The majority of geologists and physicists would accept this as fairly representing the essential characteristics of a glacier; but the small number who believe that the force urging a glacier down its bed is not due to gravity alone, but to a large extent to the increase of the volume of the ice on account of the growth of the ice grains, must utterly reject it; for, according to their hypothesis, the source of supply is not snow that falls in the névé-fields, but the water that freezes throughout the body of the glacier.

The glaciers of North America are confined to the Cordilleran mountain series and to the Greenland region. Professor Russell says that "the Cordilleran glaciers form an irregular curve, broadest and reaching the sea line in the Mt. St. Elias region, and narrowing and becoming more and more elevated at both its western and southern extremities," and then he successively describes in greater detail the glaciers of the Sierra Nevada; of the Cascade range, the higher peaks of which are volcanic cones and carry glaciers radiating from their summits; of Canada, and of Alaska. The

latter, of course, claim the greatest attention, on account of their number, size and variety. Here are the most accessible tide-water glaciers, and many tourists have already seen the birth of icebergs at the end of Muir glacier. Here also is the great Malaspina glacier, a mass of ice formed by the coalescence of the ends of many glaciers descending from the St. Elias Alps. It lies on a flat expanse between the mountains and the ocean and covers an area of some 1,500 square miles. Professor Russell has crossed this glacier along several lines and practically all we know of it is due to his explorations. It is the only Piedmont glacier that has been visited.

The absence of glaciers in the central and northern parts of Alaska is explained as due to insufficient precipitation; but in these regions we find the strange subsoil ice whose thickness has not been determined, but which in places certainly extends several hundred feet below the surface of the soil.

The glaciers in the northeastern part of the continent occur both in Grinnell Land and Greenland. Some of the former have been visited and described, but have not received much attention, whereas the latter have attracted quite a number of observers. The recent studies of Professor Chamberlin first made us familiar with certain remarkable characteristics of these glaciers which are not found in regions further south.

In the chapter on Climatic Changes, Professor Russell shows that the glaciers of North America, with a few exceptions, are growing smaller; and he mentions the efforts being made by the International Committee on Glaciers to collect information on the variations of glaciers everywhere.

In telling of 'How and Why Glaciers move,' the observations of Kock and Klocke are narrated. These observers thought they had detected certain irregularities in the motion of the Moteratsch glacier, parts of the ice moving at times up the valley. Professor Russell is cautious in accepting such an anomaly, and indeed the observers themselves have since recognized that these irregularities were within the limit of the errors of observation.

The hypotheses which have been advanced to account for the apparent plastic flow of ice, notwithstanding its great brittleness, are well given and well criticised, especially from the point of view of the geographer; though James Thomson's theory is too shortly dismissed, and Croll's hypothesis receives more attention than it deserves, for it is radically wrong. The growth of the glacier grains, as a cause of motion, has been advanced from time to time, but has not been sustained; Forel developed this hypothesis into a theory, but found later that it was not supported by his observations.

Professor Russell believes that the motion of glaciers is due principally to the plastic flow of ice under its own weight, but that many other causes play a minor part; some of these a physicist would throw out entirely.

The book closes with a very interesting chapter on 'The Life History of a Glacier.' This is an extension of Professor Davis' topographical cycle to the history of a glacier, and is an entirely new addition to glacial literature.

A slip is made on page 181 in saying that the heat absorbed when ice melts equals the heat necessary to raise the water thus formed from its freezing to its boiling point, and §11, p. 187 is misleading; exception might also be taken to the statement (p. 192) that in a vertical section through the névé-fields the maximum flow [velocity] would probably be near the bottom.

This book may be heartily commended to the general reader, and will be of great help to the student of glaciers. It is illustrated by a number of well-selected pictures and maps, and important references are given in foot-notes.

HARRY FIELDING REID.
GEOLOGICAL LABORATORY,
JOHNS HOPKINS UNIVERSITY.

Neudrucke von Schriften und Karten über Meteorologie und Erdmagnetismus, herausgegeben von PROF. DR. G. HELLMANN.

No. 7. *Esperienza dell' Argento Vivo.* EVANGELISTA TORRICELLI. *Istrumenti per conoscer l'Alterazioni dell' Aria.* ACCADEMIA DEL CIMENTO. 4to. Pp. 22, 16.

No. 8. *Meteorologische Karten.* E. HALLEY, A. VON HUMBOLDT, E. LOOMIS, U. J. LE VERRIER, E. RENOU. 1688, 1817, 1846, 1863, 1864. 4to. Pp. 13. Charts 6.

No. 9. *A Discourse Mathematicall on the Variation of the Magneticall Needle.* Henry Gellibrand. London, 1635. 4to. Pp. 7, 24.

Fascimiledrucke, mit Einleitungen. Berlin. A. Asher & Co., 1897.

Three new numbers in Dr. Hellmann's notable series of *Neudrucke* are before us, each number being of great interest and value. Dr. Hellmann certainly deserves, and we do not doubt will receive, the thanks of all men of science for the pains he is taking in preparing this set of publications. No. 7 contains reprints of the letters which passed between Torricelli and Ricci concerning the measurement of atmospheric pressure, and of the description of the thermometer and hygrometer, prepared and published by the Accademia del Cimento. The letters of Torricelli are of very great scientific interest, for they concern the famous experiment, which was carried out by Viviani in Florence in 1643, at the suggestion of Torricelli. The latter left no written statements regarding the barometer, but he sent word of his discovery to his friend Ricci, in Rome, and his two letters, most fortunately preserved, are reprinted in the present volume. They bear dates June 11 and 28, 1644, and show clearly that Torricelli knew that the mercury in the tube changed its height according to the conditions of the surrounding atmosphere, rising or falling as the air became heavier or lighter, and that he made the experiment in order that he might have an instrument for observing atmospheric changes. The report of the Accademia del Cimento concerns the early history of temperature and humidity observations. This reprint, which is a facsimile, gives two chapters of a celebrated work by Lorenzo Magalotti, Secretary of the Academy, entitled '*Saggi di naturali esperienze fatte nell' Accademia del Cimento*' (1667), in which the most important results of the experiments made by the Academy were set forth. These chapters deal with thermometers and hygrometers, and facsimiles of the original drawings of some of these instruments are given.

No. 8 of the *Neudrucke* gives reproductions of six meteorological charts, the original publication of which was in each case epoch-making. The first is the wind chart of Halley (1686), the oldest of all meteorological charts; the second, Humboldt's isothermal chart, 1817, the first one on which isotherms were given; the third is a reproduction of one of the 13 synoptic weather maps published by Loomis in 1846, the fourth and fifth charts are facsimiles of those issued by Le Verrier in September, 1863. These were the first daily weather maps with isobars, based on data sent by telegraph. The sixth chart is a reproduction of one by Renou in 1864, which was the first to give the mean isobars for any country. This gives the mean isobars of France.

No. 9 is a facsimile reprint of a very rare paper by Gellibrand (1635), which contains the first account of the discovery of the secular variation of magnetic declination.

All these reprints, like those which have preceded, contain copious notes by Dr. Hellmann, in addition to the introduction. The series is one which should be in every scientific library.

R. DeC. Ward.

Harvard University.

Biologia Centrali-Americana. Archæology. The Archaic Maya Inscriptions. By J. T. Goodman. London, R. H. Porter. 1897. 4to. Illustrated. Price, $13.50.

One of the early Spanish missionaries warns his readers against studying the native Mexican calendar system, since it is an invention of the devil and liable to disturb the faith and cloud the reason of those who seek to understand it.

It is a pity that this warning has not been heeded in the present generation by a certain class of writers, as we should then have been spared a rather extensive series of works characterized by a plentiful lack of sound knowledge and an abundance of wild speculation; among them the bulky quarto (which the author fancifully calls 'a little book'!), the title of which is given above.

It is the result, he tells us, of twelve years' labor; but when it was tendered to the California Academy of Sciences that learned body 'could not see its way' to printing the book (prudent Academy!). Mr. Maudslay, however, whose explorations have been so valuable, but who does not pretend to interpret the inscrip-

tions, was impressed by the author's claims and secured its publication in London.

That it should appear as one of the series of the 'Biologia Centrali-Americana' will give it a position liable to credit it to the intelligent public as a scientific work. This it is not in any sense, and no one can be more positive on this point than the author himself. He loses no opportunity to berate all who have attempted to apply scientific methods to the study of the Mayan inscriptions and the ancient calendars. They are 'shoe-string scientists,' 'dilletanti,' 'assumed authorities,' engaged in 'pompous kowtowing to each other.' He, the author, Mr. J. T. Goodman, announces himself as the 'illiterate proletaire' who is to 'push them rudely from their seats.' Like Walt Whitman, he 'flings his barbaric yawp over the roofs of the world.' That was fine in Whitman, but he was a poet; though Mr. Goodman can claim considerable imagination also.

Needless to add that his pages show no trace of this despised learning. The names of such European scholars as Seler, Förstemann, Rosny, do not once appear. This we may excuse, as Mr. Goodman doubtless extends his contempt to a knowledge of French and German; but one would suppose that the interesting computations of Dr. Cyrus Thomas, published by the Bureau of Ethnology, would have been vouchsafed a word. But they are not once mentioned.

He does not consider any knowledge of the Maya language necessary in order to read the inscriptions, nor an acquaintance with the mythology or culture of the tribe, nor an investigation into the origin of the glyphs. All this is beside the mark. To him, each glyph, each face or figure, each day or month sign, is a numeral, simple or complex. He ascertains their meanings by a 'sort of intuition' (p. 78); he 'arrives at a conviction' (p. 144); he has no doubt of his results, though they obstinately 'evade proof' (p. 97); but at any rate he is willing to bet considerable on their accuracy (p. 33); and this certainly ought to be sufficient for anybody except some stupid scientific reader!

Occasionally he betrays a slight but regrettable distrust of this original and excellent method. He acknowledges that this opinion is 'little more than an assumption,' or that identification insufficiently established; but his faith is not in the least shaken that time and the future big volumes he has in view will demonstrate all his positions to the satisfaction of everybody, excepting always 'the incompetent few' (p. v.), by which polite reference he means his *bêtes noirs*, the scientific students of the subject.

His main thesis is that, 'with the exception of the priests and their assistants, all the personages of the codices and inscriptions, ornaments and accessories, are composed of numeral signs' (p. 85). In illustration, he portrays the head of the 'long-nosed god,' so frequent in the Dresden Codex, and finds a numeric value in each of its elements, in the eye, the ear ring, the head dress, and even in the celebrated nose itself, which we learn stands for 13. This has been equalled in Mayan research only by the late Dr. Cresson, who dissected in a similar manner the glyphs and figures, but who found, not numbers, but phonetic elements, in each curve and crook of the work of the aboriginal artist.

The crown and completion of Mayan numeration Mr. Goodman discovers in the bird which surmounts the cross in the well-known tablet at Palenque. This is the sign of the 'grand era' of the Mayas, which he figures out to be 374,400 years. He has not fully dissected the bird, and is not quite prepared to assign the arithmetical value of each of its legs, etc.; but that is merely because he has 'not found time' for it (p. 84); and this does not in the least disturb his 'belief.'

To one unprepared by twelve years of study of hieroglyphs it is at first a little choking to swallow such a large antiquity for the Mayan culture; but Mr. Goodman wisely warns us that, in view of his researches, "we shall have to let out the strap that confines our notion of history," and acquire a 'wider mental range' than we have hitherto enjoyed (p. 149). To go back ten thousand years in the history of the happy Mayan people is to him but a trifle.

It is rather difficult to take this big volume seriously. Even the formidable tables which fill its last hundred pages fail to dispel the feel-

ing of amusement created by the author's curious notions and chosen 'wild and wooly' style, on which latter he especially plumes himself. Only, it is out of place in the 'Biologia.' It should have been issued by Bret Harte's scientific society 'on the Stanislaw,' and reported upon by 'Truthful James.'

Nor, in the hundreds of guesses of the author, has he failed of some worth passing reflection. His theory of the correction for the bissextile year is at least suggestive. His explanation of the *ua katun;* his comments on the Cakchiquel calendar; his reasons for dismissing the cypher in Mayan numeration; his argument that the ancient system of computation was to the end of a period instead of the beginning of a new one—these and some other thoughts may be rescued from the mass of crude assertions as meriting separate consideration. But, as a whole, the conviction will be forced on the enlightened reader that the cause of American archæology has gained practically nothing, and has lost something, by the publication of this heavy tome.

D. G. Brinton.

University of Pennsylvania.

SCIENTIFIC JOURNALS.

AMERICAN CHEMICAL JOURNAL, APRIL.

On the Butanes and Octanes in American Petroleum: By Chas. F. Mabery and Edward J. Hudson. The authors have studied the very volatile portions of petroleum, obtained by distilling the crude product during the cold winter months, the distillation in some cases proceeding from the heart of the atmosphere and being regulated by cooling the still. In order to identify the different hydrocarbons formed they were converted into their chlorine substitution products by bringing the vapor of the hydrocarbon together with chlorine. The distillations were carried out with great care and ingenuity and a number of derivations of butane were made and studied. The results showed that the petroleum contained no normal butane, but isobutane. In isolating the octane the authors found that a long series of distillations had to be carried on to obtain pure products. They state that these octanes do not begin to accumulate with any degree of purity until the twentieth distillation. They obtain an octane which they studied and also showed that the petroleum contained no octane boiling above 125°.

Naphthalene Tetrabromide: By W. R. Orndorff and C. B. Moyer. Naphthalene tetrachloride has been studied by a number of chemists, but the corresponding bromine compound had not been prepared until the authors of this paper undertook its investigation. They found it could be prepared by treating naphthalene, in sodium hydroxide, with bromine. Cracked ice was put in the flask and also around it to prevent any decomposition taking place from the heat developed. A white cystalline substance was obtained which melted at 111° C. The cystallography of this substance was studied, the angles measured and the more common forms drawn. Many attempts were made to obtain an isomeric substance, but they all failed. The molecular weight could not be determined by the boiling-point method, but some rough determinations of the molecular weight of the tetrachloride were made and the composition of the bromide deduced from this by analogy. By this method and by analysis the composition was shown to be $C_{10}H_8Br_4$.

On Hydrocobaltocobalticyanic Acid and Its Salts: By C. Loring Jackson and A. M. Comey. This work was undertaken in the hope of preparing, from potassium cobalticyanide, compounds analogous to the nitroprussides. When this compound was boiled for some time with strong nitric acid a gelatinous substance was formed, which was found to contain all the cobalt and to have the composition $KH_3CO_3(CN)_{11}H_2O$. This is the monopotassium salt of hydrocobaltocobalticyanic acid. The barium, silver, copper and zinc salts of the acid were also prepared. When the monopotassium salt was treated with potassium hydroxide cobaltic hydrate was precipitated and a substance was isolated from the filtrate which proved to be potassium cobalticyanide. The fact that the substance crystallized in needles instead of in broad, rhombic crystals was probably due to a slight amount of impurity. While some of the properties of these substances are similar to those of the ferrocyanides and ferri-

cyanides, they are not such as would aid speculation on the nature of their salts.

On the Analogies in Composition of the Salts of Calcium, Strontium and Barium: By J. H. KASTLE. The author calls attention to the strong analogies which exist between the calcium, barium and strontium salts. According to the views of Lenssen strontium and barium show greater analogies, in the composition of their salts, to one another than they do to calcium. In this paper the author cites a large number of salts, and concludes from a study of their composition that the analogy and composition of the calcium, barium and strontium salts of any given acid is just as likely to show itself between the salts of all three of these metals, or between the calcium and strontium salts of that acid, as it is between the calcium and barium salts, or those of strontium and barium, and *vice versa;* or that, so far as composition of their salts is concerned, these three metals are altogether similar.

Action of Mercaptides on Quinones: By H. S. GRINDLEY and J. L. SAMMIS. This article contains a preliminary notice of an investigation being carried on by the authors, on the action of mercaptides or substituted quinones. They have obtained a product, by the action of sodium mercaptide on dichlor-diphenoxyquinone, which is very unstable and decomposes in the presence of water, forming tetrathioethylquinone. Some of the derivatives of this substance were also prepared and studied.

The Action of Sodium Ethylate on Amide Bromides: By S. E. SWARTZ. It has been shown that amines can be formed from acid amide bromides by treatment with caustic alkali, and that the peculiar rearrangement which takes place in the molecule is perfectly analogous to the so-called Beckmann's rearrangement of ketoximes. These changes take place in alcoholic solutions, and it was suggested that, perhaps, if the substances were brought together in some solvent which would not produce electrolytic dissociation, the rearrangement might be prevented and direct substitution effected. It was found that succinimide bromide, treated with dry sodium methylate, regenerated succinimide, that no rearrangement took place, and that at the same time bromine was not replaced by the methoxy group. When the reaction was carried out in alcoholic solution in every case rearrangement was effected. A number of amide bromides were decomposed in this way, and in every case the action took place as described above. One of the products, phenyl urethane, was treated with phosphorus pentachloride and chloroformanilide and phenyl isocyanate were obtained. As these compounds had been studied very little, a number of their derivatives were prepared and studied.

The Hydrolysis of Acid Amides: By IRA REMSEN. The author calls attention to the changes produced by the action of dilute acids on acid amides. It has been shown by him, in the course of an investigation on the oxidation of substitution products of aromatic hydrocarbons, that when chromic acid is used, an oxidizable residue, situated in the ortho position with reference to a group that is not oxidizable, is almost completely protected from oxidation, while similar groups in the meta or para position are easily oxidized. An investigation is now being carried out which, up to the present, shows that the ortho amide resists the action of the hydrolysing agent to a marked degree, while the meta and para amides yield readily, the latter more so than the meta. The investigation will be extended to other amides to see if they will conduct themselves in the same way.

A review of Lehrbuch der allgemeinen Chemie, W. Ostwald; Zweiten Bandes, zweiter Teil; is also contained in this number of the *Journal.*

J. ELLIOTT GILPIN.

TERRESTRIAL MAGNETISM, MARCH, 1897.

WITH the present number, this journal, devoted to Terrestrial Magnetism and allied subjects, such as Earth Currents, Auroras and Atmospheric Electricity, enters on its second volume. The editor, Dr. L. A. Bauer, having been appointed assistant professor at the University of Cincinnati, the office of publication has been transferred to that institution. The contents of the present number are:

The Effect of Hardness on the Electrical and Magnetic Constants of Steel, with Particular Reference to the Tempering of the Magnetic Parts of Instruments, Carl Barus; Vertical Earth-Air Electric Currents,

L. A. Bauer; Magnetic Work at the Kew Observatory, Charles Chree; On the Distribution of Magnetic Observatories over the Globe, Adolf Schmidt; Results of Magnetic Observations on the Greenland Expedition of 1896, G. R. Putnam; Letter to Editor: A Proposal with Regard to an International Magnetic Congress, A. Schuster.

Professor Barus, in his article, gives a valuable summary of the results obtained in the tempering of magnetic needles, by Dr. Strouhal and himself, some years ago. The article, which is illustrated, closes with rules for the practical treatment of magnets, where great secular permanence of magnetization is the principal desideratum.

Dr. Bauer investigates the matter of electric currents passing from the air into the earth or from the earth into the air. If such currents exist, their presence will be indicated by the non-vanishing of the line integral of the earth's magnetic force, resolved along a closed curve of the earth's surface. The author selects, as his closed circuits, parallels of latitude between 60° N and 60° S and distant by 5° from each other. He bases his investigations on the Neumeyer magnetic maps of 1885. The result of the investigation would seem to be that, apparently, an appreciable part of the earth's total magnetism can be referred to an effect similar to that of vertical electric currents. The average intensity of these currents for the region between 60 N and 60 S would be about one-tenth of an ampere per square kilometer of surface.

Dr. Chree gives an interesting account of the work done at Kew Observatory, of which he is Superintendent. Dr. Schmidt finds that the present distribution of magnetic observatories, the great majority being on European ground, is far from satisfying the demands of modern science. In order to establish some criterion with regard to the precision to be obtained in the results of a geomagnetic investigation as based upon the present observatories, he undertakes a mathematical examination, making various combinations of existing observatories and proposed ones. It is remarkable how much the addition of one or two observatories in the southern hemisphere will reduce the probable error in the coefficients of the spherical harmonic series representing the phenomenon under consideration. New observatories are, above all, needed in the southern part of South America, the central Pacific and in New Zealand.

Mr. Putnam summarizes his recent magnetic work in Greenland. Professor Schuster proposes that an International Magnetic Congress of all those interested in the subject be held in 1899.

THE AMERICAN PHYSICAL EDUCATIONAL REVIEW.*

THE American Association for the Advancement of Physical Education has made a new departure in the line of publication. This Association has been in existence since 1885 and has published ten reports containing papers given at the annual meetings. These reports have been increasing in size and value and constitute the best literature of physical education in English.

In the reorganization of the Association, which took place a year and a-half ago, the annual meetings ceased, to give place to triennial or quadrennial conventions. The effort is now being directed to the formation of local physical education societies and of State branches, making it possible for the teachers to have sections in connection with the County and State Teachers' Associations. Twelve local organizations have already sprung up and are exhibiting signs of considerable activity in their monthly and annual meetings.

The interests of the National Association are in the hands of a Council of nine members, who act as an executive committee in all matters relating to the Association's interest. The National Council, after publishing the Tenth Annual Report, which fell to their lot at the close of 1895, have undertaken, instead of such annual reports, the publication of the *American Physical Educational Review*, the first volume of which has just appeared. It is proposed during 1897 to publish four numbers consisting of about 60 pages each, to contain original articles relating to physical education, reprints of articles not easily accessible to members of

* Published quarterly under the auspices of the American Association for the Advancement of Physical Education. Edited by E. M. Hartwell, G. W. Fitz, R. G. Huling. Cambridge, 1896.

the Association, reviews of related literature, etc.

The first volume consists of the following original and reprinted papers:

'Peter Henry Ling, the Swedish Gymnasiarch,' by E. M. Hartwell; 'The Olympic Games and Their Influence upon Physical Education,' by Ellery G. Clark; 'Statistical Sketch of the Present Status of Physical Training,' by Karl Zapp; 'What the City of Braunschweig, Germany, Does for the Physical Training of her Children,' by Ernst Hermann; 'Report of Committee of the Boston Physical Education Society, to Suggest a Substitute for the Manual of Arms as a Means of Physical Exercise in the Military Training of School-boys;' 'Military Drill in the Public Schools,' by D. A. Sargent; 'Manual Training: Its Educational Value,' by Thomas M. Balliet; 'The Influence of Exercise upon Growth,' by Henry G. Beyer; Brookline Public Bath; Reports from Societies; Editorial Notes and Comment; Book Notices and Bibliography; 'Index to the Ten Reports of the A. A. A. P. E.,' by J. M. Pierce.

One of the most important contributions to this number is the Index to the ten reports of the A. A. A. P. E. prepared by Mr. John M. Pierce. The National Council have decided to strike this off as a reprint for the benefit of those who desire to bind it with the reports. The report of the Committee on Military Training has also been reprinted and should do good educational service in combating the misguided efforts in different parts of the country to foist military drill on the public schools in place of a rational system of sports, games and physical exercises. Copies of both these reprints may be obtained by application to the Corresponding Secretary, Dr. G. W. Fitz, Cambridge, Mass.

The Council of the A. A. A. P. E. are to be commended for their boldness in undertaking this publication, and to be congratulated on its creditable appearance. Teachers in general will feel indebted to them for making accessible valuable papers on physical education, especially since the low price of membership, one dollar per year, brings the *Review* easily within their reach. G. W. F.

HARVARD UNIVERSITY.

SOCIETIES AND ACADEMIES.

SCIENTIFIC ASSOCIATION OF THE JOHNS HOPKINS UNIVERSITY.

THE one hundred and thirty-second regular meeting was held March 18, 1897, President Remsen in the chair.

The papers presented and read were:

1. 'The Projection of Panoramic Views of Contoured Surfaces,' by Josiah Pierce, Jr.

The principal subjects brought up for discussion were: 1. The metrical and projective properties of contours and bas-reliefs. 2. The principles involved in the projection of irregular plane-figures and surfaces. 3. The practical applications of the laws of projection in the design of perspectographs and mechanical aids to projection.

It was demonstrated in the paper that the general problem of the projection of an irregular surface of any form could be reduced to one of great simplicity by the methods suggested by the author of projecting successive contours or equidistant sections of the surface. The methods were shown to be applicable to the illustration of complex geological problems, which under ordinary conditions would require to be illustrated upon models, and for the solution of many difficult problems in projection, such as the determination of shadows on irregular surfaces and the development of bas-reliefs and projective forms.

Illustrations were given of a number of practical applications of the methods by drawings of very irregular surfaces developed in relief by the projection of contours—such as panoramic views of wide areas, and surfaces developed in high or low relief under different conditions of projection from horizontal vertical and inclined sections.

In the discussion given of the general problem of the projection of irregular plane figures two methods of operation were presented—one involving the metrical and projective relations of corresponding points of plain figures in perspective, applicable in the design of perspectographs and linkages; the other the relations of corresponding lines in perspective—applicable in the methods of tracing the projections of irregular figures—enclosed in nets of intersecting lines.

It was shown to be possible to perform any operation of plane perspective with a sliding linkage of three rods and by a slight modification of the pantagraph to obtain any desired orthogonal or parallel projection of an irregular figure or surface.

The author also called attention to the extreme simplicity of the methods of projecting extensive panoramic views from contoured maps by the employment of a linkage of two threads, the methods being fully illustrated by the drawings and models accompanying the paper.

2. 'The Nerve Impulse in its Relations to the Strength of the External Stimulus,' by C. W. Greene.

The papers presented and read by title were:

1. 'A New Form of Mirror for Reflecting Telescopes,' by Chas. Lane Poor.

The mirror is a portion of a paraboloid of revolution, cut at the extremity of the parameter. The advantages over the old form were indicated as follows: Utilization of the full aperture; the reflected beam being at right angles to the incident light; no second mirror necessary; possibility of constructing mirrors of great focal length; possibility of such mirrors of short focal length, replacing photographic doubts.

2. 'A New Form of Equatorial Mounting for Reflecting Telescopes.'

With mirror of the above form an equatorial mounting becomes very simple; the declination axis becomes the telescope tube, the mirror being mounted at extremity of such axis and capable of revolving about it in a manner similar to the large flat of the equatorial condé.

The image is formed at the intersection of the polar and declination axes and is always in the same position; the observer, therefore, remains at rest while viewing any and every part of the visible heavens. A single reflecting surface replaces three in the reflecting equatorial condé, and four in the forms mentioned by Wardsworth. No dome is required. Many other advantages were indicated and several modifications of the general form pointed out.

Note. — Experiments with mirrors of the above form are now being carried out at the University.

CHAS. LANE POOR,
Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON, 274TH MEETING, SATURDAY, MARCH 27TH.

Mr. M. B. WAITE spoke on 'Factors Governing Pear Blight,' showing that the very conditions which were favorable to the growth of the tree were also favorable to the development of the disease, and that an important factor in combating the blight was the prevalence of a considerable degree of drouth.

Mr. Theo. Holm gave a historical review of our knowledge of 'The Grass Embryo and its Constituents.' He described the embryo as defined by Malpighi and authors of recent date, saying that there seemed to be good reason for adopting the explanation of its structure given by Malpighi more than 200 years ago. This involves the definition of both the 'scutellum' and the 'lobule' as independent leaves, while the 'pileole' thus becomes the first sheathing leaf or the second leaf proper after the cotyledon. A full account will soon appear in an article upon Fuirena, by the speaker, in the *American Journal of Science.*

Dr. E. A. De Schweinitz described 'Some Methods of Generating Formaldehyde and its use as a Disinfectant,' showing a specially devised form of lamp with a platinized wick by which large volumes of the gas could be readily generated.

F. A. LUCAS,
Secretary.

NEW BOOKS.

The Materials of Construction. J. B. JOHNSON. New York, John Wiley & Sons. 1897. Pp. xv + 787. $6.00.

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